

BOBP/WP/85
Post-Harvest Fisheries

**PROCESSING AND MARKETING
OF ANCHOVY**
(in the Kanniyakumari District, South India)

**The processing and marketing of Anchovy
in the Kanniyakumari District of South India :
Scope for development**

by

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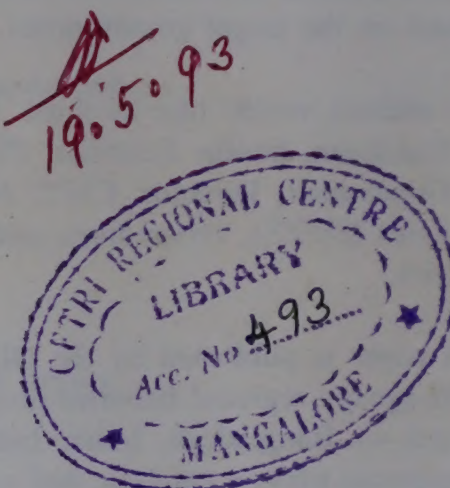
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The Bay of Bengal Programme's
Post-Harvest Fisheries Project
in collaboration with Kanyakumari District
Fishermen's Sangams Federation (KDFSf) and the
Central Institute of Fishing Technology (CIFT),
Kochi.



From 1989 to 1992, the Bay of Bengal Programme's (BOBP) Post-Harvest Fisheries Project, funded by the Overseas Development Administration (ODA) of U.K., has been working together with the Kanniyakumari District Fishermen's Sangams Federation (KDFSf) based in Nagercoil, Tamil Nadu, India, to provide assistance in resolving several problems associated with the traditional practice of drying and marketing Anchovy. It was shown that losses in potential earnings as a result of poor fish landing, spoilage and low product quality were very significant. This was due primarily to the local practice of drying the fish directly on the beach sand.

An analysis of the market, both domestic and export, provided several important insights into the potential for developing value-added and higher quality products based on the existing, traditional *kattumaram* fishery. These have shown that dried Anchovy is a highly desirable product amongst a wide range of socio-economic groups in many countries, ranging from West Asia through South Asia to Southeast Asia. Given quality and presentational improvements, a quality premium is payable which can mean a fivefold increase in the product's wholesale price.

Simple and low-cost drying racks made from casuarina poles and second-hand netting were developed with the participation of artisanal fishermen from Kanniyakumari. These were demonstrated as being a technically and socio-economically desirable means of achieving improvements in product quality and providing a simple method of enhancing producers' incomes.

This paper describes not only the development of the technical systems which have helped the KDFSf and fishermen achieve these results, but also discusses the methodologies and socio-economic considerations behind the project. Emphasis is placed on analysing potential impact on the target communities.

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SUMMARY

This paper describes the artisanal *kattumaram* fishery of Kanniyakumari District in Tamil Nadu, South India, and focusses on some of the critical post-harvest problems and issues related to the traditional processing and marketing of Anchovy.

This district is very active in fisheries, producing some 15 per cent of the total catch of the State. Despite an increasing trend towards fresh marketing outside the district and, especially, towards lucrative exports of crustaceans and cephalopods, local markets still represent around 90 per cent of the volume and about 60 per cent of total revenue.

Kanniyakumari boasts the highest landings of Anchovy (*Stolephorus* spp; *Nethili*: Tamil) in the state. Although data are scarce and generally unreliable, landings in the district probably vary from 5000-10,000 t/year representing some 60-70 per cent of the State's total.

As a backdrop to the description of activities carried out and further proposals made by the project, the paper provides a characterization of the existing fishery. The three principal target species of Anchovy are described, as are the locations, seasons and the gear used to catch them. The traditional markets and marketing channels within India and to Sri Lanka are then examined and information on current price structures is presented.

There is much concern, backed up by several anecdotal reports, about heavy losses of Anchovy as a result of poor processing and restrictive marketing. The fishermen themselves were the first to point these problems out through their own representative body, the Kanyakumari District Fishermen's Sangams Federation (KDFSF), a non-governmental organization comprising active fishermen from several of the local communities. BOBP was approached by KDFSF in 1989 and asked to provide advice on what was clearly a major issue of considerable local concern.

The resulting studies of losses carried out directly by BOBP and, at the request of BOBP, by the Central Institute of Fisheries Technology (CIFT), Kochi, indicate that glut landings of these fish during certain periods of the year create a vast oversupply to local fresh fish markets. In order to avoid gross financial losses, the only realistic option open to the fishermen/processors is to dry the Anchovy on the sand. This is, at best, a hazardous operation, being carried out in direct contact with, more often than not, filthy beach sand which adheres to the product and often comprises 20 per cent of the final product weight. Other problems are caused by:

- Seasonal rainfall and the difficulties in drying when in close contact with humid sand;
- Excessive heat of the sand during sunny periods, when the product becomes cooked and very fragile; and
- Poor product storage and prevalence of insect infestation.

Ignorance of many of these factors by the fishermen is the rule rather than the exception. Few attempts have been made in the past to alleviate the situation.

The extremely poor quality product which results from this is downgraded to low value, animal feeds. Losses are, therefore, characterized in terms of 'economic loss' *i.e.* loss in potential revenue to the producer, and to actual physical loss, where the product is sometimes buried or used as fertilizer in local coconut gardens.

Realistic estimations of loss are extremely difficult to make, largely because it is unlikely that glut landings could ever be fully and adequately converted into value-added (*i.e.* improved quality) product and lost revenues thereby realized. After all, who is going to invest in machinery or infrastructure capable of handling the large volumes concerned and which may only be used for short periods during the year? For the sake of illustration, however, the data presented indicate a theoretical level of economic loss, calculated assuming that downgradation is eliminated and that

current market prices of the highest grade traditional product are achieved for the entire production. This indicates a level of loss in income of about 50 per cent.

The original studies of losses had suggested that the potential for tackling these problems through improving processing and marketing was good. In order to test how much impact could, in fact, be made on reducing losses, a series of practical trials were set up in coordination with the KDFSf.

As a **first step**, trials with low-cost and simple technology were carried out. Multi-layer drying racks were tested, and the trials demonstrated that technical problems of poor product quality could indeed be overcome in a cost effective way. Moreover, parallel studies of the market for Anchovy in India also showed potential for value-addition in that, although the price of traditional dried Anchovy was relatively inelastic, consumers were willing to pay a higher price for a better quality product.

Further market studies of dried Anchovy showed that several other options existed for marketing of a value-added product. Sri Lanka has traditionally imported large volumes of Anchovy from India. A dramatic decline in imports from India from 97 percent in 1985 to 11 per cent in 1988 combined with a huge increase in imports of high quality product from Thailand, underlined the demise of the Indian product. As less becomes used for export, the demand for raw material for low-grade animal feeds has become an easy option for the communities involved in this fishery. The potential for improved marketing and, especially for redeveloping the Sri Lanka export market, led to the subsequent project inputs.

The **second step** carried out during 1991 involved setting up, with KDFSf, a pilot processing centre in an Anchovy producing community. One tonne of high quality product was produced and utilized for test material. The main outcome of this was to confirm that, as long as quality can be kept high, higher prices and wider marketing potentials were appreciable for three processing options:

- The whole rack-dried product derived mainly from the seine net fishery (**head-on**);
- The rack dried, de-headed product from the gillnet fishery (**head-off**), and
- A dried fillet (**flake**) made from the rack-dried, head-off product.

Markets for these products were identified in Southeast Asia and West Asia where quality considerations are becoming of paramount importance. Moreover, it was also found that good potential exists within India, especially amongst the middle to upper income urban groups, who were prepared to pay for quality.

A conclusion from these initial trials was that the current level of economic loss can be partially resolved. This is achievable not through attempting to improve the quality of the **total** production, but through adding considerably to the value of a small proportion of the landings. Indeed, as the paper goes on to demonstrate, **the enhanced quality (i.e. value-added) products**, such as those produced by the project, have the clear potential to achieve market prices **much higher** than those currently obtainable for the highest grade traditional product. This is achieved through the application not only of simple technology, but also through several novel marketing strategies which are described.

Through the development of close working relationships with participating fishermen and Federation officials, this 'pilot' study also helped clarify the social feasibility of the project. A significant social benefit resulting from any development of this activity would include the employment generation potential for village women within the target areas. The manufacture of the flake product, for example, is extremely labour intensive, requiring one woman-day to produce one half kilogram of finished product. Product packing would also create employment.

A **third step** is now proposed. This involves the development of a commercial, community-level

project, coordinated and managed initially through the KDFSf members. This builds upon the experience already assimilated and continuing to rely heavily on complete participation of the target communities and community organizations at all levels. Costed proposals are presented and they demonstrate the economic and social feasibility of the options presented.

The commercial project involves the establishment of 120 drying rack units in two communities in Kanniyakumari District. These would be operated by fishermen family units selling the product to the project through the village *sangam* (fishermen's village level association linked to KDFSf). The project would be implemented through a simple organization operating, initially, under the direct control of KDFSf (with advice from BOBP) and, possibly, later becoming an independent company. This organization would be responsible for controlling quality, manufacturing flakes, organizing packing and marketing the product; it would be accountable to the Federation itself.

The level of production initially proposed for the project is 59,400 kg/year, comprising a mix of the three products described above. There will be upto 29 flake processing units, each employing five women, with an aggregate annual capacity of 12,090 kg of flakes. These units would manufacture flakes from dried, head-off Anchovy previously purchased from the fishermen. The total annual turnover is expected to be in the region of IRs. 2,632,000.*

The success of the project hinges on the assumption that the per kilogram revenue achieved by the new and better quality products is considerably higher than at present: whereas weighted average prices for sand-dried Anchovy bought from the target communities over the last two years indicate a sale price of only 7.40 IRs/kg, the project would purchase the rack-dried product from the fishermen at a minimum initial payment of 20 IRs/kg and sell at a minimum of 35 IRs/kg. The flake would sell at 130 IRs/kg.

The fishermen would also receive a bonus payment of 90 per cent of net profits on a shared, *pro rata* basis. Ten percent would be retained by the project/KDFSf for reinvestment purposes. These payments would be deferred for some time until annual profits have been calculated. At the rates indicated, however, the fishermen could expect to earn about three times the current rate per kilogram of dried Anchovy sold. Moreover important employment opportunities would be created for village women involved in the flake-making.

A calculated internal rate of rate of return of about 80 per cent for the project prior to financing is very acceptable. However, the means of financing is clearly an area which must be carefully assessed. Although the fixed capital outlay is small, working capital requirements are high due to the labour-intensive nature of the project and likely delays in payment for the finished product.

Apart from finance, the project appears to be sensitive to product price.

Flake production is the most preferable option, as this yields a higher return at the product price assumed. An increase in flake production would also have great social benefit in terms of increased employment. A problem, however, would be the increasing difficulty in controlling product quality. Doubling the production level of simply head-on or head-off product yields the same return as the standard model.

The commercial project is regarded as a preliminary stage to a much wider, district-wide or even regional activity. This, and the activities which led up to its implementation, could serve as a model for other communities with similar socio-economic structures which face similar fish processing and marketing problems.

* US \$ 1 = IRs. 28/= appx.

1. INTRODUCTION

1.1 Fish production and marketing in Kanniyakumari District

Kanniyakumari District is situated in the State of Tamil Nadu at the southernmost tip of India (see Figure 1). About 120,000 people live in the 44 coastal fishing villages which are spread along the 64 km coastline, stretching from Kerala in the northwest to Cape Comorin in the southeast. Fishing is wholly artisanal in nature and mainly conducted from non-motorized *kattumaram* craft and *vallam* using traditional gillnets, hook-and-line and boat seines. Beach seines are also operated extensively in this district.

The annual fish production of Kanniyakumari District is approximately 50,000 t, about 15 per cent of the total for Tamil Nadu. Approximately 12 per cent of the landings are marketed fresh outside the district, 2 per cent of these being destined for export and 10 per cent for major urban markets

Fig 1. Principal fishing communities of Kanniyakumari District

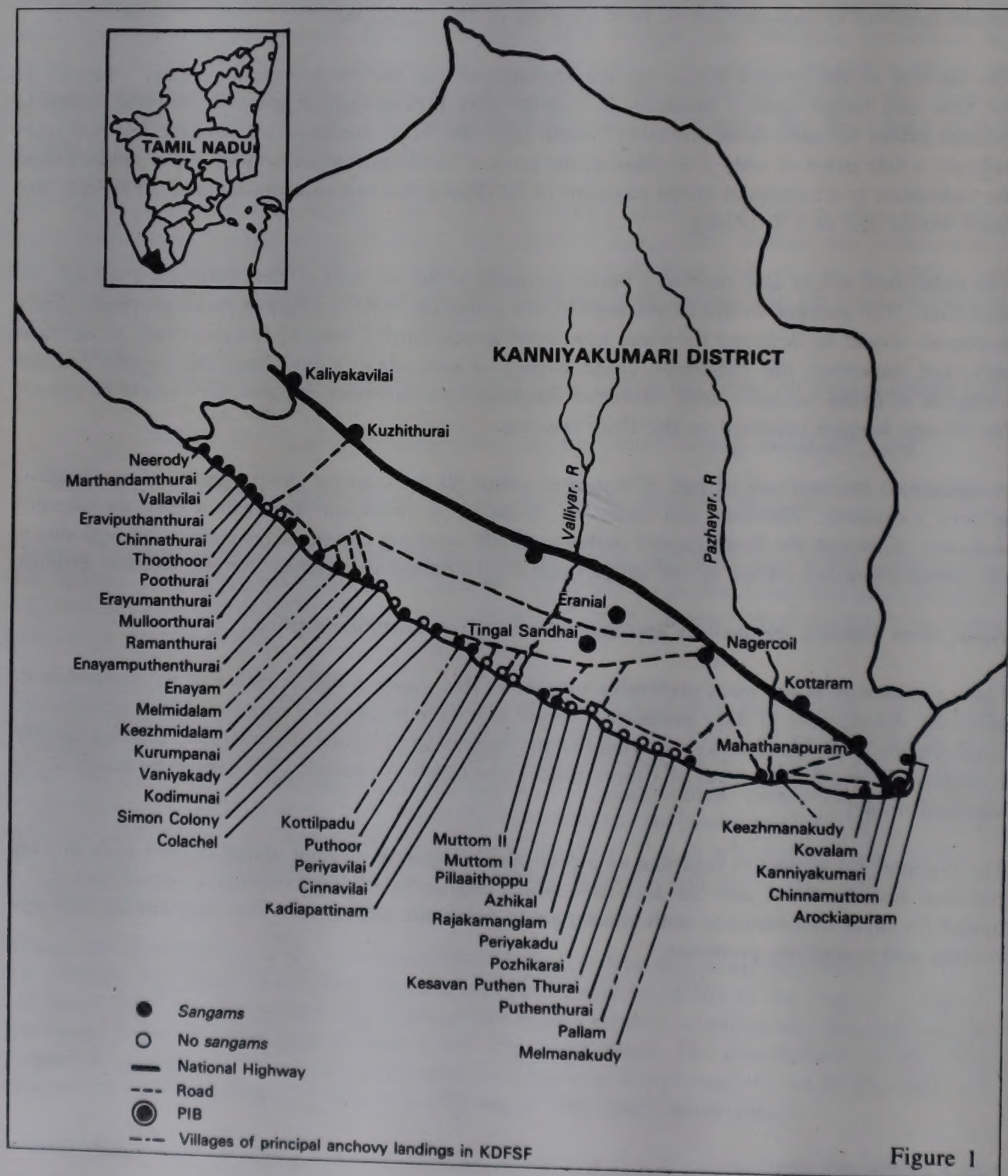


Figure 1

and Kerala (see Table 1). The remaining 88 per cent is utilized either for local fresh fish sales (about 40 per cent), an operation carried out primarily by women headloaders and cycle traders, or for traditional processing (about 45 per cent) into low value, cured products, both for human consumption and animal feeds. Although the actual quantity marketed fresh outside the district is only a small proportion of the overall catch quantity, the high value of these species means that this trade probably represents about 44 per cent of catch value.

Table 1: Breakdown of marketing of fish products from Kanniyakumari District by volume and value (figures are estimates)

Market	Quantity (t)	%	Value (Rs.millions)	%
1. Exports	1,000	2	260	31.7
2. High value Indian urban markets	2,500	5	45	8.9
3. Major local markets, esp. Kerala	2,500	5	20	4.0
4. Kanniyakumari District cycle vendors/head loaders	20,000	40	160	31.7
5. Traditionally processed	24,000	48	120	23.7
	50,000	100	405	100.0

Source: SIFFS (1992)

Although the dependency on these high value products is likely to increase in the long term (see 3.2.2 'Export marketing'), traditional marketing and processing patterns will continue to provide the bulk of the incomes of these communities, at least for the foreseeable future.

1.2 Anchovy

Table 2 provides a breakdown of catch volumes and values for ten villages in the Kanniyakumari District through one complete year. These data, collected by the South Indian Federation of Fishermen's Societies (SIFFS), an apex organization for Sangam Federations in Tamil Nadu and Kerala, clearly show the relative importance of Anchovy (*Nethili*), which represent over 50 per cent of the landings, but only 16 per cent of the value. Shrimp, on the other hand, represents about the same commercial value, but with only 1.3 per cent of the volume.

Table 2: Fish production in 10 villages of the Kanniyakumari District, Tamil Nadu, during August 1988 to July 1989

Tamil name	English name	Landings (t)	% share	Value (Rs. 000)	% share	Avg. price (Rs/kg)
Finfish						
Valai nethili	Gillnet Anchovy	2,705.6	45.2	4,950	12.6	1.83
Madi nethili	Seinenet Anchovy	320.9	5.4	1,530	3.9	4.77
Choorai	Tuna	515.3	8.6	4,734	12.0	9.19
Valameen	Bream	205.1	3.4	2,030	5.1	9.90
Valai	Silverbar	174.1	2.9	936	2.4	5.37
Kozhiyalai	Horse mackerel	173.2	2.8	1,465	3.7	8.46
Chalai	Sardine	147.3	2.5	974	2.5	6.61
Mural	Rainbow sardine	143.9	2.4	533	1.4	3.70
Vattai	Carangids	130.4	2.2	1,466	3.7	11.24
Kalavai	Rock cod	112.6	1.9	965	2.4	8.57
Neymeen	Seer	73.8	1.2	1,092	2.8	14.79
Others		1,129.5	18.8	8,921	22.6	7.90
Subtotal		5,831.7	97.3	29,595	75.1	5.07
Crustaceans and molluscs						
Mudakkural	Shrimp	75.4	1.2	6,790	17.1	90.05
Kallural	Lobster	9.4	0.2	1,336	3.4	142.13
Kanavai	Cuttlefish	29.2	0.5	1,408	3.6	48.22
Olakkanavai	Squid	24.3	0.4	227	0.6	9.34
Others		21.4	0.4	71	0.2	3.32
Subtotal		159.7	2.7	9,832	24.9	61.57
Total		5,991.4	100.0	39,427	100.0	6.58

Source: SIFFS (1992)

1.3 Social organization

According to several sources (e.g. ODI, 1991), a large proportion of the fishermen in Kanniyakumari District are indebted to trader/financiers who have traditionally played an important role in financing small-scale fishing and fish marketing. However, high interest rates (ranging typically from around 36 per cent to over 60 per cent per annum), and a degree of obligation on behalf of the fisherman to dispose of his catch through the creditor/merchant or his agent, lead to the existence of market conditions which are somewhat less than perfect. This factor, in combination with the generally poor catches, have tended to suppress the potential for economic self-sufficiency amongst many of the local fishermen.

The formation of fishermen's *sangams* under the auspices of the Kottar Social Service Society (KSSS) has played a leading role in attempting to improve marketing conditions, primarily through the organization of collective sales and elimination of debt. The first fishermen's *sangams* were formed in Kanniyakumari District in 1974. By 1981, there were nine *sangams* with 530 members.

The Kanyakumari District Fishermen's Sangams Federation (KDFSF) was formally established in 1982, taking over the co-ordinating role previously played by the KSSS. Its current membership comprises 34 village-level societies, representing approximately 2,500 fishing families, or 12.5 per cent of the fishing population, in Kanniyakumari District. As the communities within the district become increasingly aware of the socio-economic benefits which accrue to *sangam* members, it is expected that membership will increase in the medium term.

The activities of the KDFSF are

- **Marketing** of export and other species through *sangams*;
- **Commercial**: shop for selling nets and accessories at subsidized rates;
- **Social**: education, training, insurance, income generation, credit and savings schemes, and
- **Political**: lobbying on sectoral issues, to a certain extent through the SIFFS.

KDFSF is run on a democratic basis, with decisions taken by a committee of elected representatives from member *sangams*, all of whom are active artisanal fishermen within the communities which they represent.

A major role and, indeed, the mandate, of the KDFSF has been to raise the income levels of its members through the competitive marketing of high quality produce. Thus, for example, in one village (Melmanakudy) during the 1989 shrimp season, *sangam* records show that sales prices for members' shrimp were about 50 per cent higher than non-members' (ODI 1991). Many other similar examples exist.

1.4 Post-harvest losses

It is now clearly recognized by *sangam* members that improved post-harvest handling and processing, in addition to marketing, are key factors in helping the communities to achieve enhanced revenues from fish sales. Significantly, it is now realized that opportunities exist not only in the higher value exportable items, such as shrimp and table fish, but also in much of the high volume traditional produce. The product which, arguably, has the greatest potential of all to achieve income enhancement through quality improvement simply due to the quantity produced, is dried Anchovy.

Glut landings of Anchovy during a three-month peak season often lead to considerable losses through spoilage, a situation which has long caused dissatisfaction amongst the fishermen. In 1988,



Kattumaram returns with full load of Anchovy: Kovalam, Tamil Nadu.



Traditional beach drying area at Kovalam, Tamil Nadu.

the KDFSf brought this problem to the attention of the Bay of Bengal Programme (BOBP) (Sanders 1988). It was then felt that improved drying techniques would help to reduce these losses.

As a result, an initial study of the handling and processing of Anchovy was carried out on BOBP's behalf by the Central Institute of Fisheries Technology (CIFT, Kochi) during the 1989 fishing season. Some of the findings of that study are presented in Table 3.

Table 3: Results of study of Anchovy handling and processing in Kanniyakumari District

Estimated total marine landings:	45,600t		
Anchovy landings	6,840t		
of which :			
Used for fresh	1710t	25%	
Used for drying	5130t	75%	
of which :			
Decayed (lost/fertilizer use,etc.)	1710t	33%	
Dried for foods and/or feeds	3420t	67%	

Source : CIFT 1990

Although, it is now felt that the true figure for total Anchovy **physical losses** is probably considerably less than the estimate given by CIFT (1710t) there is clearly a major **economic loss**, i.e. **loss in potential revenue**, as a direct result of product quality downgradation. That is, what is potentially a high grade food fish is almost invariably of such poor quality that it receives only the lowest market prices and, more often than not, is downgraded to low value animal feeds. The net result of this is demonstrated in Tables 4 and 5 (facing page).

Table 4: Estimated economic losses in dried Anchovy incurred by 30 fishermen in five villages of Kanniyakumari District (August - November 1990)

Actual revenue through sale of dried Anchovy
(Total catch: 50,500 kg)
(Appx. weight after drying: 16,817 kg)

Quantity sold (kg)	(%)	Price at weighted avg (IRs/kg)	Actual revenue (IRs)	Potential revenue (on the basis of 15 IRs/kg)	Total loss of revenue (IRs)	Loss per fisherman (IRs)
84	0.5	14.00	1,176		252,248	180,029
17	0.1	12.50	210		— 72,219	÷ 30
286	1.7	10.00	2,859			
34	0.2	9.00	303			
67	0.4	8.00	538			
5,701	33.9	6.00	34,205			
404	2.4	5.50	2,220			
34	0.2	4.00	135			
10,191	60.6	3.00	30,573			
16,817	100	4.29	72,219	252,248	180,029	6,001

Source : Marketing survey, Kanniyakumari District, BOBP-ODA/KDFSf, 1990

Note : 1. A 33% weight loss during drying is assumed

2. The sample comprised six fishermen from each community; data collected daily.

Table 5: Estimated economic losses incurred by two KSSS sangams in Kanniyakumari District during 1991/92 Anchovy season

Villages	Production (kd)	Price (Rs/kg) (weighted avg)	Actual revenue	Potential revenue *	Economic loss
Melmanakudy	75,773	7.28	551,922	1,136,588	584,665
Kovalam	45,130	7.58	341 900	676,944	335,044
Total	120,903	7.39	893,822	1,813,532	919,709

Source : From sangam records

* Assumes 15 Rs/kg sale price

The first of these is based on estimated landings and sales by 30 sample fishermen in Kanniyakumari District during 1990, whilst the second is based on actual sales data for 1991 supplied by two sangams. In both cases, assuming a value-added sales price of 15 IRs/kg, (a figure based on the results of market research presented below), it can be seen that the loss in potential income is considerable.

However, it should be borne in mind that some of the landings are exceptionally heavy and that, even with the best intentions, it would be unrealistic to achieve optimal value for 100 per cent of the production.

Amongst the factors responsible for this economic loss to the community are:

- Excessive landings during peak periods;
- Total lack of drying facilities (fish is simply dried in layers on the sand);
- Insanitary condition of the beach and, hence, the product;
- High sand content of product;
- Poor packaging and storage which promote insect infestation and product physical damage; and
- Inefficient marketing practices.

1.5 Project inputs

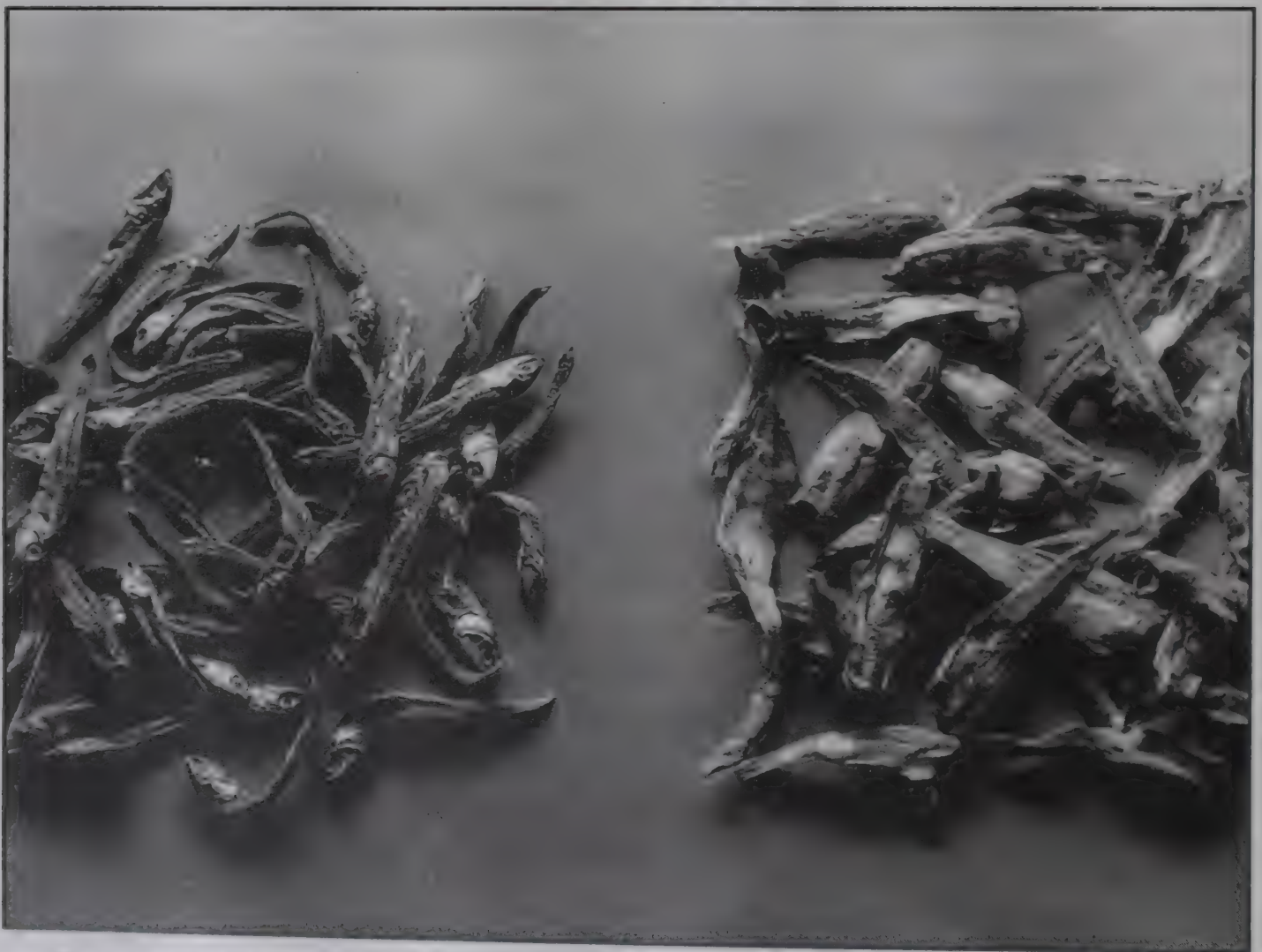
A report on Anchovy marketing in Sri Lanka (Bostock 1990) raised the issue of declining export of Anchovy to Sri Lanka from India. This was found to be due to the poor quality of sand-dried Anchovy from India and its replacement by high quality, rack-dried Anchovy from Thailand. In addition, during 1990 and 1991, further studies of the market for dried Anchovy were undertaken by the BOBP Post-harvest project. Data were obtained on landings, utilization and marketing practices. These showed that clear opportunities existed for implementing a cost-effective programme of improved technology which would enable traditional markets, such as the Sri Lankan one, to be reopened and new markets developed, with a better quality and value-added product. Some of the results and recommendations of these studies are presented in Sections 2-4.

As a result of the field marketing studies, technical trials were initiated during the 1990 Anchovy season in collaboration with CIFT and KDFSf. Several designs of simple net-and-pole racks were tested and small quantities of what was judged as high quality product were manufactured. These were, however, insufficient for carrying out conclusive test marketing.

Hence, during the 1991 season, a pilot processing centre was set up under the auspices of KDFSf in one of the communities where Anchovy landings are traditionally high. Over one tonne of dried product was manufactured through this centre to provide material for test marketing purposes. Parallel marketing studies showed clearly that several processing options were available as long as quality could be maintained. Products manufactured and tested include 'flakes' (dried deboned and descaled fillets), dried 'head-on' (three species) and dried 'head-off' (three species). Prices



Drying of Anchovy on simple racks shows marked improvement in drying rate and product quality.



Two of the high-quality products made using the racks: head-on and head-off Anchovy.

obtained for specimen quantities were significantly higher than for the traditional product. For example, 500 kg of dried 'head-off' were sold in Madras at 30 IRs/kg compared with the average local sales price of 7-9 IRs/kg and wholesale prices in Madras between IRs 12 and 15. Moreover, a market survey carried out in Sri Lanka during the trials revealed a considerable interest in this market for the product. Bearing in mind the positive indications from the market and the apparent social and technical feasibility of implementation of the new drying technology at community-level, it is now proposed to expand the project into a commercial, community-wise operation. The details which follow provide further in-depth background information on the scale and nature of the Anchovy fishery, the problems encountered post-harvest, and the nature of the market. The proposed methodology to be adopted and the economic and social cost-benefit are analyzed and discussed.

2. FISHERY

2.1 Species and distribution

There appear to be three species of Anchovy of commercial importance landed in large quantities in Tamil Nadu, their distribution as well as local nomenclature being determined, as far as can be ascertained, by geographical location (see Figure 2). These are:

- White Anchovy (*Stolephorus indicus*; Tamil: *ven nethili*): mainly landed to the southeast of Colachel village; (see Fig. 1)
- Black Anchovy (*Stolephorus devisi*; T: *karu nethili* southeast of Colachel, T: *neel nethili* northwest of Colachel, T: *rama nethili* in Ramanathapuram): fairly general distribution;
- Poruman Anchovy (*Stolephorus commersonii*; T: *peruma nethili* south-east of Colachel, T: *karu nethili* northwest of Colachel): mainly landed in Kanhiyakumari District.

The season for predominant landings varies along the coast (see Figure 3). When the sea is calm after the Northeast Monsoon, from October to March/April, Anchovy is found from north to mid-Tamil Nadu. This is followed by a short season in the South starting in April and ending in May with a one-week peak. The longest season is from the last week of July to

Fig 2. Anchovy species of commercial importance in South India

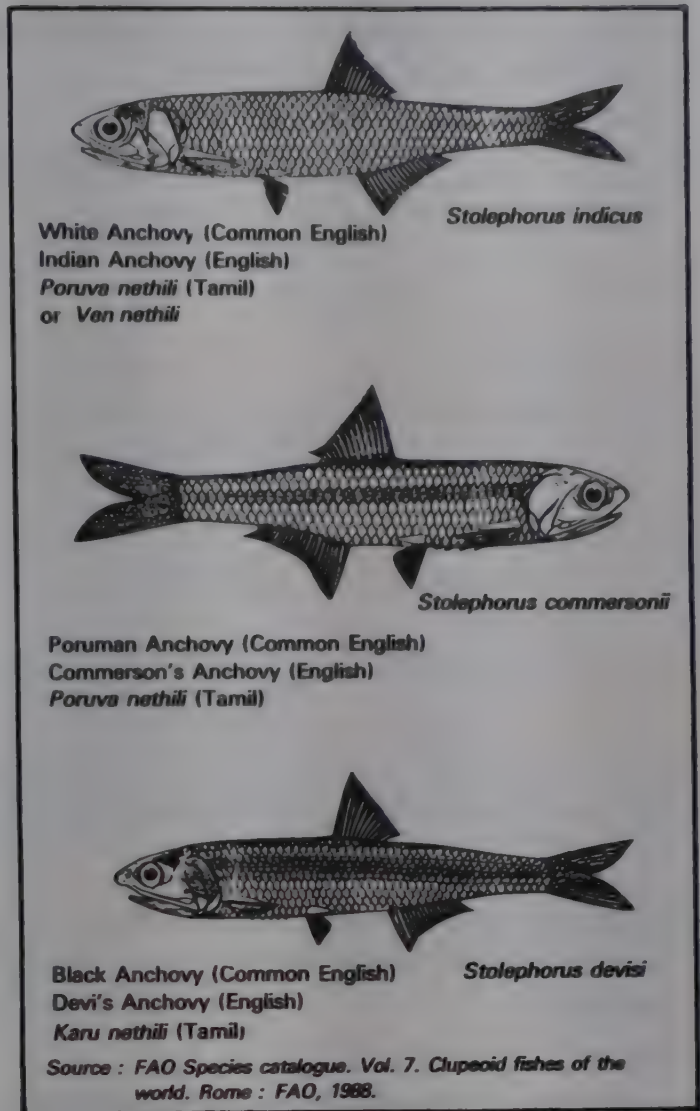


Fig 3. Principal Anchovy seasons along the coast of South India



November, which starts before and continues into the Northeast Monsoon period. The peak landings, however, are from September to November.

Table 6 gives an approximate comparative breakdown of total Anchovy landings (all species) in Tamil Nadu from the mid-1980s.

Table 6: Anchovy landings in Tamil Nadu by district (t)

<i>District</i>	<i>1986-87</i>	<i>87-88</i>	<i>88-89</i>	<i>89-90</i>	<i>90-91</i>
Madras	338	197	32	16	5
Chengai Anna	692	423	278	66	503
South Arcot	804	1322	238	182	196
Thanjavur	3329	1299	858	1068	1973
Pudukottai	—	—	64	300	16
Ramnathapuram	12	—	—	1	21
Chidambaranar	—	819	2070	322	519
Tirunelveli	322	14	297	—	15
Kanniyakumari	9680	6994	7926	7086	5846
Total	15177	11068	11763	9041	9094

Note : Chidambaranar District came into existence only in 87'- 88'.

Source : Department of Fisheries, unpublished statistics collected on 10.5.91.

Kanniyakumari, the southern-most district of Tamil Nadu has the largest landing of Anchovy for Tamil Nadu with nearly 64 per cent of the total landing for 1990-91 of Tamil Nadu being from this district.

The data in Table 6 represent the only official statistics available and a note of caution should be made with regard to their interpretation. As almost all this catch is landed by artisanal fishermen spread throughout the whole coastline, these statistics can only be regarded as indicative.

2.2 Fishing methods

Anchovy is captured with three main gear: **gillnets**, **boat seines** and **beach seines**. In Kanniyakumari, there are estimated to be some 2000 small mesh gillnets, 600 boat seines and some 50 beach seines (information provided by fishermen). Tables 19 and 20 of the Economic Appraisal (Section 5) give further information on actual distribution by village.

- **Gillnets** used in Anchovy fishing (see Figure 4a facing page) are of small mesh nylon construction, locally called *kacha valai*. Mesh varies from 13.5 mm to 16 mm and 10-20 kg of net could be taken fishing. The net is operated from *kattumaram* of four or more logs and operated by two or three men. In Kanniyakumari, most of the Anchovy fishing is done by gillnetting. A characteristic of this fishing method is that because the Anchovy is shaken from the nets after landing, the product is invariably headless, attracting a lower market value (see Table 2).
- **Boat seines** are traditional nets called *thattu madi* (see Figure 4b, facing page). The net is made of jute, hemp and cotton in different sections and is operated by 7-9 men from two *kattumaram* of slightly differing sizes. The operation of this net is declining due to lack of space for subsequent drying of the net. The Anchovy caught this way are with head, small and, generally, obtain a higher price than gillnet caught fish.
- **Beach seines** are also traditional nets (see Figure 4c, facing page). They are known locally as *karaimadi* (or *karaivalai* in the Palk Bay region of Tamil Nadu). The net is made of jute, hemp and cotton. The total length between wings can be upto half a kilometre. This net is hauled from the shore but is laid at sea usually by a stitched boat. Eight to twelve men go in the boat with the net leading the head rope with one wing left behind on the beach. The other wing with the rope is brought back to land where 15 to 20 persons, including women and children, then proceed to haul the ropes

and bring the net ashore. This net needs a good breadth of beach for operation and, therefore, only a few villages can use it. In Kanniyakumari District, due to lack of space, there is a decline in this type of fishing. On the Palk Bay coast, however, where space is not a limiting factor, beach seines are more numerous (often numbering 20 per village). Owing to the fact that the Anchovy are often landed in live condition with heads intact, the Anchovy landed by this net are considered the best in quality terms, irrespective of species, and fetch a higher price in the market (see Table 2).

Fig 4. The main gear used to catch Anchovy

Fig. 4a. Gillnets

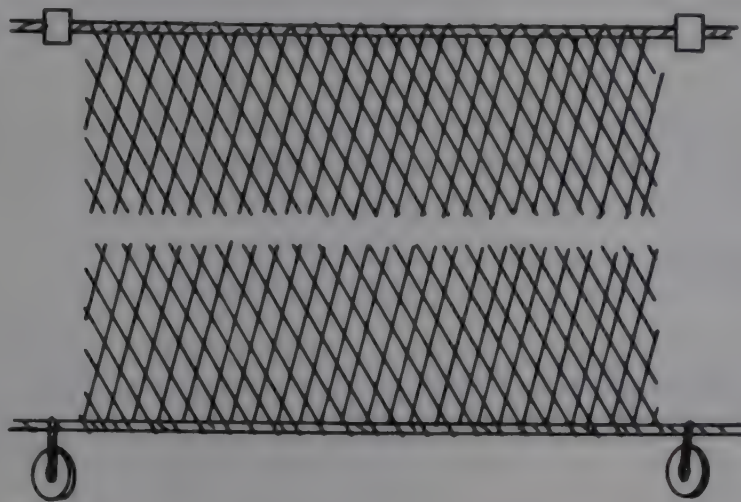


Fig. 4b. Boat Seine

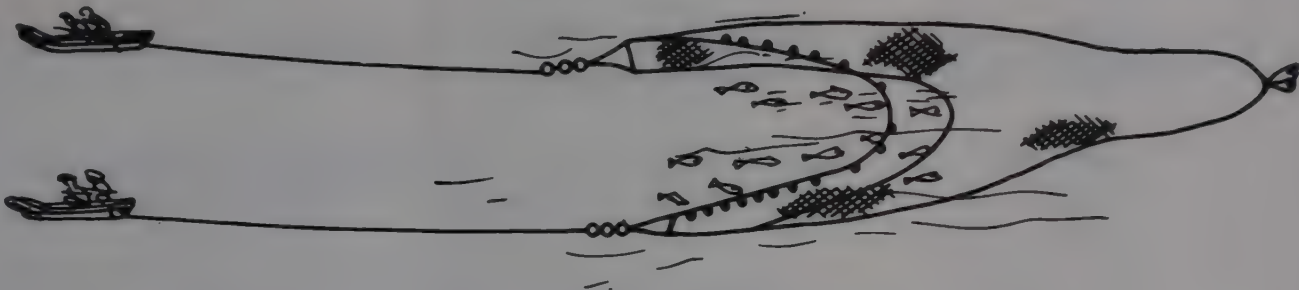


Fig. 4c. Beach Seine



2.3 Utilization of the catch

Anchovy of all species are marketed either directly in fresh form (approximately 5 per cent of total landings) or are dried under rudimentary conditions for later sale for direct human consumption or for animal feeds. During a very heavy, average season, only about 35 per cent of the dried Anchovy goes for human consumption, the rest destined for the large poultry feed markets. During very heavy landings, especially in the rainy season, the quantities utilized for human consumption drop considerably due to the difficulties involved in drying and the lack of space. Often fish is left to rot and is sometimes buried or used as manure. The likely extent of these losses during a typical season has been indicated in Tables 3, 4 and 5.

The increased utilization of Anchovy by the developing markets for small-size fresh fish, especially in Kerala, has helped spur its beach prices, especially during non-peak landing periods when little of the catch is used for drying. However, due to its size and soft texture compared to other small fish, such as Silverbelly, transport difficulties remain a problem. Moreover, in spite of its growth, the fresh market can only absorb a small percentage of the total catch.

2.4 Traditional drying

The traditional drying process, which has been practised in this region for many decades, is very simple and involves little labour and no capital costs. Upon landing, the Anchovy is packed in baskets, carried to the chosen section of beach (which is open access) and spread out on the sand. Occasionally, during glut periods, several layers of fish are placed one on top of another and drying is severely impaired. The drying fish is turned over every now and then and takes up to two days to dry, given reasonable conditions.

The main problems inherent in traditional drying are :

- Contamination from adhering sand, which often comprises 20-30 per cent of the product weight;
- Highly insanitary conditions on the beach, which may lead to contamination of the product with micro-organisms and insect larvae;
- High temperature of the sand during periods of hot sunshine, which tends to cook the fish, producing a brittle product which disintegrates easily during subsequent handling and distribution;
- Lack of protection during rain;
- Slower drying in wet weather due to proximity to damp sand; and
- The Anchovy being accessible to scavengers and other pests which attack it, resulting in a very low quality dried product.

Traditional processing does, however, offer the fisherman certain advantages :

- Low labour and zero capital cost; and
- The possibility of adding sand, which, the fishermen believe, increases the value offered because of the additional weight.

Due to pressure from exporters, there has recently been an attempt to improve processing. Financiers in Ramanathapuram, for example, have invested in preparing hard clay drying platforms. The dried Anchovy from Ramanathapuram is mostly exported to Sri Lanka. In other regions such as Karnataka, the Anchovy is dried on whitish, 'clean' sand and this sells for a higher price in the

market even if it is headless. However, neither of these innovations addresses all the problems highlighted above.

2.5 Packing and storage

Traditionally, Anchovy is packed in 50-100 kg gunny bags. As the product is brittle, due to having been cooked on the hot sand, this method of packing often results in considerable damage to the fish, especially during transportation. Up to 5 per cent of the consignments could be severely damaged in this way (reported by wholesale merchants at Madras). When the dried Anchovy is destined for export it is wrapped in palmyra mats and then put inside a 25 kg gunny bag. This packing is considered suitable for transport by schooners to Sri Lanka as it affords some physical protection of the fish. It is, however, more susceptible to insect infestation than, say, woven polypropylene sacks.

Dried Anchovy is normally stored by the merchants for up to two months. As new supplies arrive, these replace old stock. An exception to this is during the lean season (Jan.-Feb.) and when fish landings are low; the product may, then, be held in storage for up to six months. When headless Anchovy is stored for more than one month stockists are known to treat the Anchovy bags with pesticides of various kinds. Insect infestation is reported to be a problem during longer periods of storage and several traders have made enquiries about pest control techniques to reduce *Dermestes* and *Necrobia* infestations.

3. THE MARKETING OF DRIED ANCHOVY

There are two major outlets for dried Anchovy:

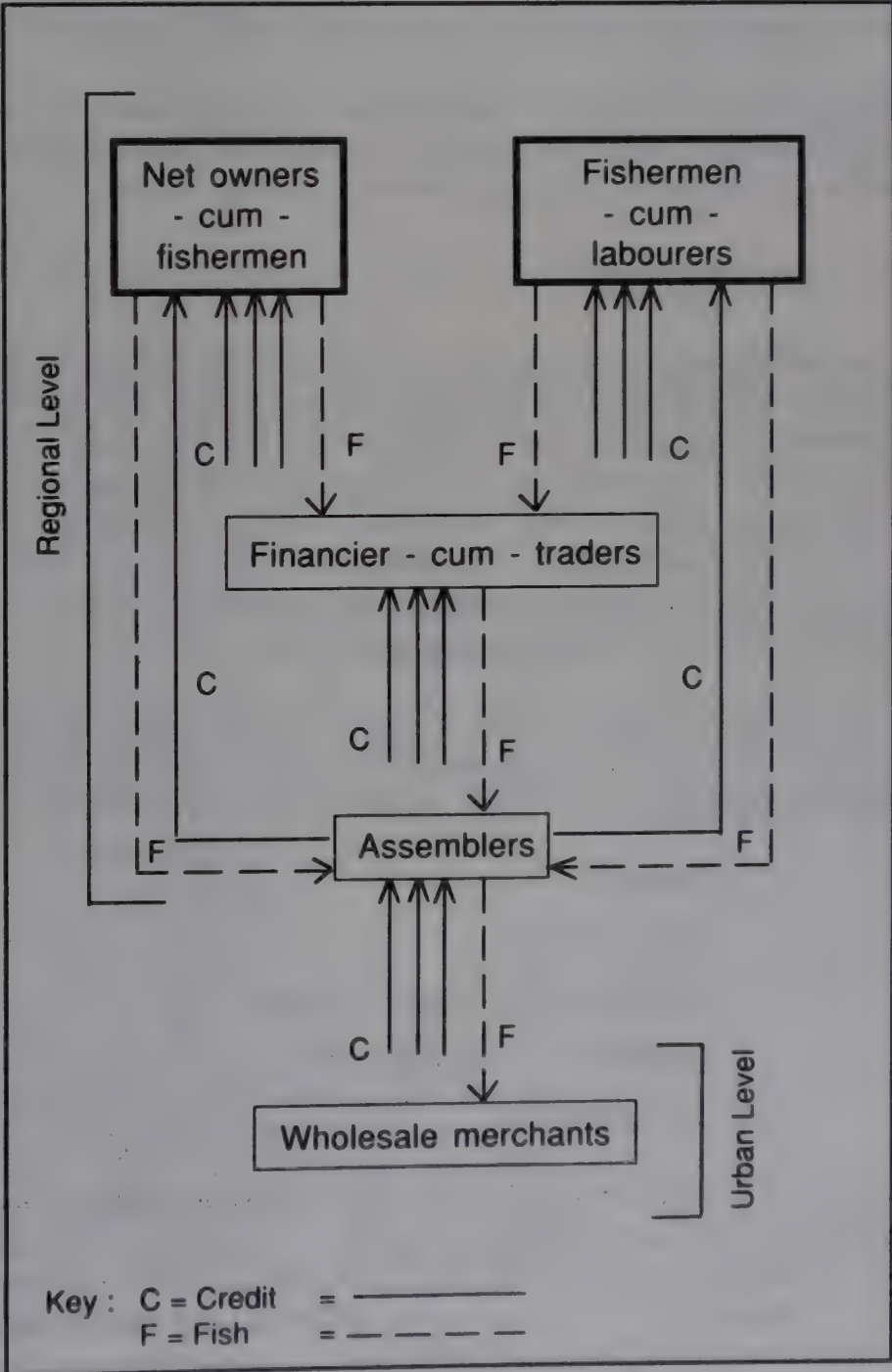
- **Direct human consumption:** Domestic and export markets.
- **Indirect human consumption:** Poultry feeds for national markets.

Prior to discussing these in detail, the existing traditional marketing channels for **all** dried Anchovy, whether for human or animal consumption, are examined below.

3.1 Traditional market channels

As the distance from the landing centre to the final consumer can be great, there are a number of functionaries involved in the marketing chain, each of whom has a distinct role to play (see Figure 5).

Fig 5. Traditional market channel for dried Anchovy in Tamil Nadu



The marketing channel starts with the financier-cum-trader at the production level.

3.1.1 FINANCIER-CUM-TRADERS

The financier-cum-trader is the primary source of private credit for the net-owner. He advances money to the net-owner at the beginning of the season to enable him to purchase fishing gear, hire contract labour and commence operations. The advance taken for operating beach seines is higher than that taken for gillnets because Anchovy from seine fishing is of better value and the operations are expensive due to the large labour force involved.

By providing credit on time, the financier enables the fisherman to commence operations at the beginning of the Anchovy season. The credit system is flexible and the loan amounts can vary according to the particular needs of the fisherman. For example, at the beginning of the season, when only gillnets are operated, the advances are low. However, during peak landings when seines are operated, the advances increase. Besides this, the financier advances money to the net-owner for his social needs, such as marriage expenses or for building a new house, and this amount is added on to the advance.

In return, the financier gets **exclusive rights to buy the Anchovy landed** and dried by the net-owner. The price will be pre-established at a rate lower than the prevailing market rate in order to recover the interest on the advance given to the net owner. The interest is usually lower than the interest charged by local money lenders, which may vary from 5 to 16 per cent per month. Repayments are not expected when there are poor landings or if it is a lean season. Credit given to kin may have preferential rates, around only 5 per cent being charged.

Hence, the relationship is long-standing in nature, based on established patron-client relationships, and is usually carried on from one generation to another with the result that the net-owners most often deal with one particular financier-cum-trader only.

3.1.2 ASSEMBLERS

Assemblers are secondary level traders who, in turn, lend money to the financier-cum-traders. These traders are obliged to supply the assemblers. The assemblers mainly belong to the Muslim community and have traditionally been dry fish merchants. The financiers are also predominantly Muslims and are bound by strong kinship ties to the assemblers. Here too, intense patron-client relationships exist between the financiers and the assemblers. Every assembler has his own exclusive network of financiers-cum-traders who will not deal with any other due to the nature of this relationship. In a village, depending on its size, up to three, or sometimes more, financiers operate, but assemblers will number only one or two.

The assemblers clean the fish of sand and store it until, in their opinion, an opportune time rises in the market. The decision whether the dried Anchovy will go for human consumption, poultry feed or export is taken by the assembler. This decision depends on the following factors:

- Quality;
- Prices offered;
- Advances taken from the dealers;
- Landings of Anchovy; and
- Storage period.

Assemblers usually take advances from domestic wholesale merchants. They are then obliged to supply dried Anchovy to these merchants. Assemblers and wholesalers in Madras both belong to the same Muslim community and, quite often, kinship ties also exist between them. The interest on the advances is recovered by the wholesalers by making adjustments in the procurement price. Export merchants, however, rarely provide any advance to the assemblers.

Assemblers can also be financiers-cum-traders or net-owners. For example, of the four assemblers consulted in Mandapam, the assembler with a large-scale operation is also a net-owner while another assembler is also a financier-cum-trader.

3.1.3 WHOLESALE MERCHANTS

Wholesale merchants operate from large urban centres and towns, such as Madras or Tuticorin, where access to a large consumer retail network, or to other wholesalers in other cities or countries, in the case of export, is easily available.

Some wholesale merchants have long-standing relationships with assemblers to whom they have advanced money at the beginning of the season. Since most of these relationships are based on trust, defaulting is rare and leads to blacklisting. Strong kinship ties reinforce the system and tend to prevent defaults. Wholesalers employ agents who procure the product from their regular assembler contacts.

3.2 The market for dried Anchovy for human consumption

While it is a general rule that dried fish of comparatively good quality is accepted for human consumption and poorer quality fish goes for poultry feed, there are, during the lean season, instances when insect-infested Anchovy with excess sand ('trash') are sold in small markets for human consumption. This reflects the strong demand for this product throughout the year.

Dried Anchovy for human consumption has two markets:

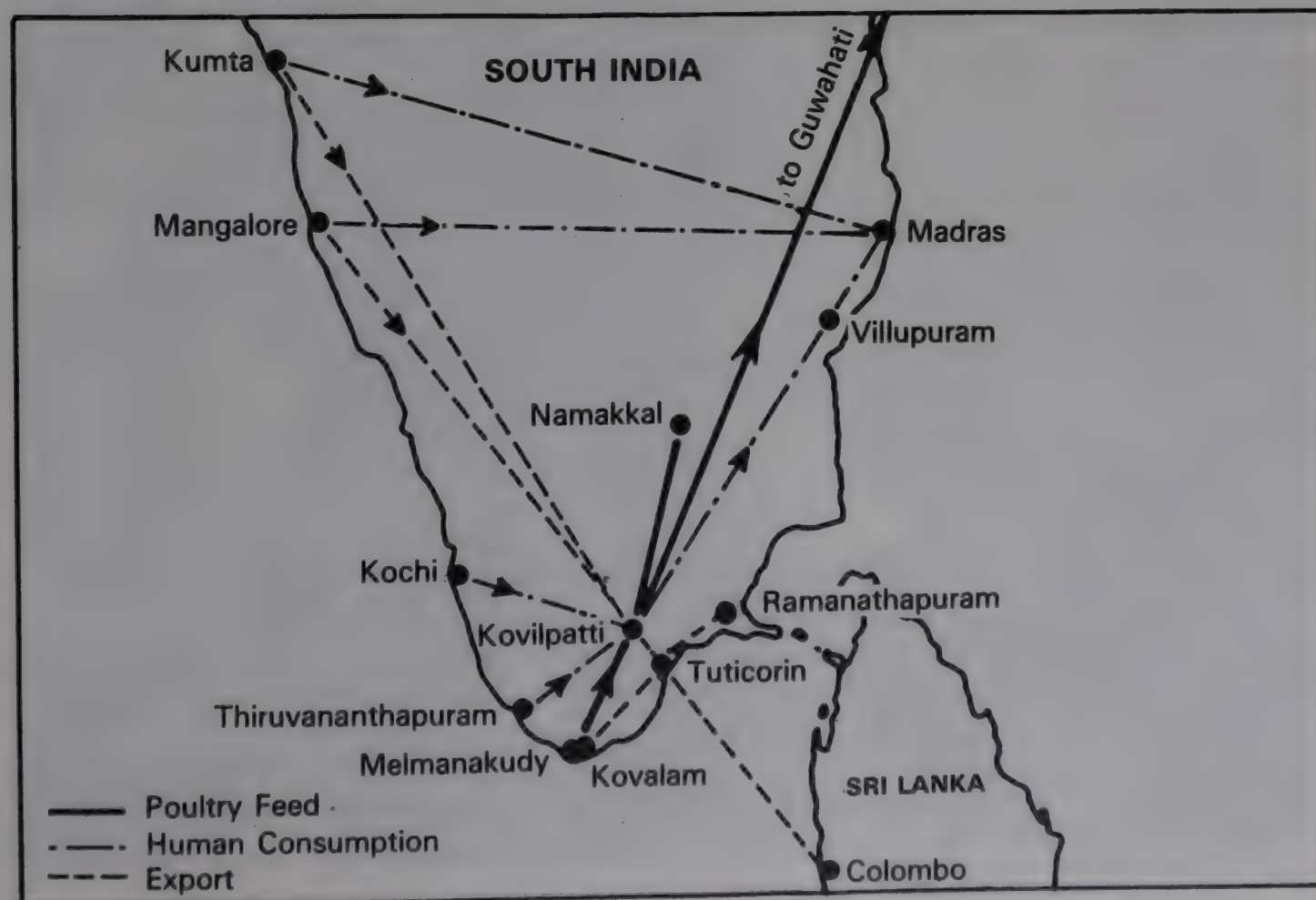
- The domestic market; and
- The export market.

Each system is discussed in detail below.

3.2.1 DOMESTIC MARKETING

Figure 6 provides a summary of the principal market channels for dried Anchovy in India.

Fig 6. Anchovy market channels for domestic and export markets



Moolakothalam dry fish market in Madras city is the most important dry fish market for human consumption in Tamil Nadu. This market handles more than 10,000 t of dried fish every year and supplies not only local retail markets but also other wholesale markets outside the state, such as in the eastern and northeastern regions. The northeastern states form the largest consumer centre for dried fish in India. Low quality dried Anchovy is in great demand here because the local hill tribes prefer these low-cost varieties.

Kovilpatti, in Chidambaranar District, in southern Tamil Nadu is a major collection centre for dried Anchovy from Kanniyakumari, Tirunelveli-Kattabomman, Chidambaranar and Ramanathapuram districts. Its main role however is that of wholesale marketing and distribution of Anchovy for animal feed.

Consumer preferences

Species preference reflects the main species available (see section 2.1) viz. *Stolephorus indicus*, *S. devisi* and *S. commersonii*. Although subject to confirmation by market research underway at the time of writing, it is most likely that the average consumer would not be able to differentiate between these. More important from the consumers' point of view, are the following characteristics (source: Moolakothalam traders):

- Size — the smaller the better;
- Presence of head preferred;
- High flesh content;
- Absence of sand and other impurities;
- Light colour; and
- Free from pests and insects.

Price structure: Calculation of procurement prices

This presents an interesting and complex problem as a 'sand factor' must be included in all transactions. This factor has become almost institutionalized in some centres and so the fisherman/processor is encouraged to include as much sand as possible with his dried product. An example of the discounting method is given in Table 7 below (source: example provided by a group of assemblers and financiers in Ramanathapuram District):

Table 7: Price discounting due to sand in product

Functionary	Actual weight (kg)	Discount weight (%)	Assumed fish weight (kg)	Actual (Rs/kg)	Adjusted (Rs/kg)
Fishermen	128	22	100	5	3.90
Sand removed (Fin.-cum-trader)	12 116	14	100	7	6.00
Sand removed (Assembler)	14 102	2	100	9	8.80

Source : Tuticorin Anchovy traders' example given



Dried Anchovy, along with other cured fish products, on sale at Moolakothalam wholesale market, Madras, one of the biggest markets in South India.



Customers bargain for dried Anchovy at the Moolakothalam market, Madras.

By way of explanation, the financier-cum-trader will sample the product and estimate the percentage sand content. In the typical example given above, although the total bulk lot weighs 128 kg, the buyer assumes 22 per cent sand content (the 'usual' quantity), giving an assumed fish weight of about 100 kg. In actual fact, the quantity of sand may be considerably less than this. If the actual rate is 5 IRs/kg, then the fisherman actually receives 3.90 IRs/kg based on the actual weight. This is repeated down the marketing chain, but at each level the total product is unpacked and sand is removed, hence the discount factor reduces as the product becomes cleaner.

Actual market prices

Tables 8 and 9 provide indicative information of dried Anchovy prices in Madras from October 1991 to April 1992. Strong variations are noted due to gross fluctuations both in supply and in demand. There is, for example, a peak in demand during the first quarter of the year due to the Muslim Ramzan festival.

Table 8: Wholesale prices of traditional dried Anchovy (with sand), Madras, 1991-92 (Rs/kg)

In general, prime quality (Grade I) traditionally dried Anchovy with sand obtains 14-25 Rs/kg in the wholesale market in Madras. The higher end of this price range is operational at the beginning of the season, when landings are comparatively low. However, the price dips to the lower end with peaks in supply *e.g.* after 4 - 10 lorry-loads (*i.e.* 40-100 t) reach the market. This is a significant quantity considering that a merchant's turnover is about 3-4 t/day. Secondary quality (Grade II) dried Anchovy sells for considerably less than the wholesale rate for first quality.

	Grade I	Grade II
October	12	9 - 10
November	13-15	8 - 9
December	15	10 - 11.5
January	18	12
February	15-16	9 - 10
March	18-22	10 - 11
August	20-40	18 - 32
September	20-35	15 - 28
October	22-30	16 - 20
November	20-30	16 - 22

Source : P.A.P Sahib Company Ltd., Sajeer Trading Company, Madras.

Note : Grade I — intact, good colour, less sand, no visible infestation.

Grade II or III — increasing breakage, worse colour, more sand and, sometimes, presence of insects.

No data collected April - July.

Table 9: Comparative wholesale Anchovy prices in principal South India markets for 1990-92

Centre & date	Source supply	Indicative beach price (Rs/kg)	Market price (Rs/kg)
1990			
Bangalore (human cons.)	Mangalore Ratnagiri Kovilpatti Kanniyakumari	4 - 10	15 - 18
Madurai & Tiruchi (human cons.)	Kanniyakumari Tuticorin Kovilpatti	4 - 10	12 - 15
Kovilpatti (poultry feeds)	Mangalore Tuticorin Kanniyakumari	5	6 - 8
1991-92		Grade I	Grade II
Tuticorin (export)	Kanniyakumari Allapuzha Kollam Tiruchchirappalli Mangalore	13 - 16	9 - 10

Sources : Dried Anchovy dealers in Madras and Tuticorin (1992). Market Study, BOBP (1990).

3.2.2 EXPORT MARKETING

General trends

In stark contrast to the dearth of information available on quantities and values of dried fish marketed internally, figures for export markets abound.

Between 1975 and 1991, owing to its proximity to the main export market, Sri Lanka, Tamil Nadu accounted for, on average, about 87 per cent of the total exports of dried fish from India. Over the last decade there appears to have been two significant trends in exports (see Table 10):

- Increase in exported frozen/fresh items from 4,073 t in 1981 to the present figure of just over 25,000 t;
- A decrease in the quantity of dried fish exported, from an average of 4,876 t for 1981-90 to the present level of just over 1000 t. For comparative purposes, the average export levels for 1975-81 for dried fish were 2950 t/year (Tamil Nadu, Department of Fisheries, Int. brochure no.7).

Table 10: Marine product exports
from Tamil Nadu 1981-1991

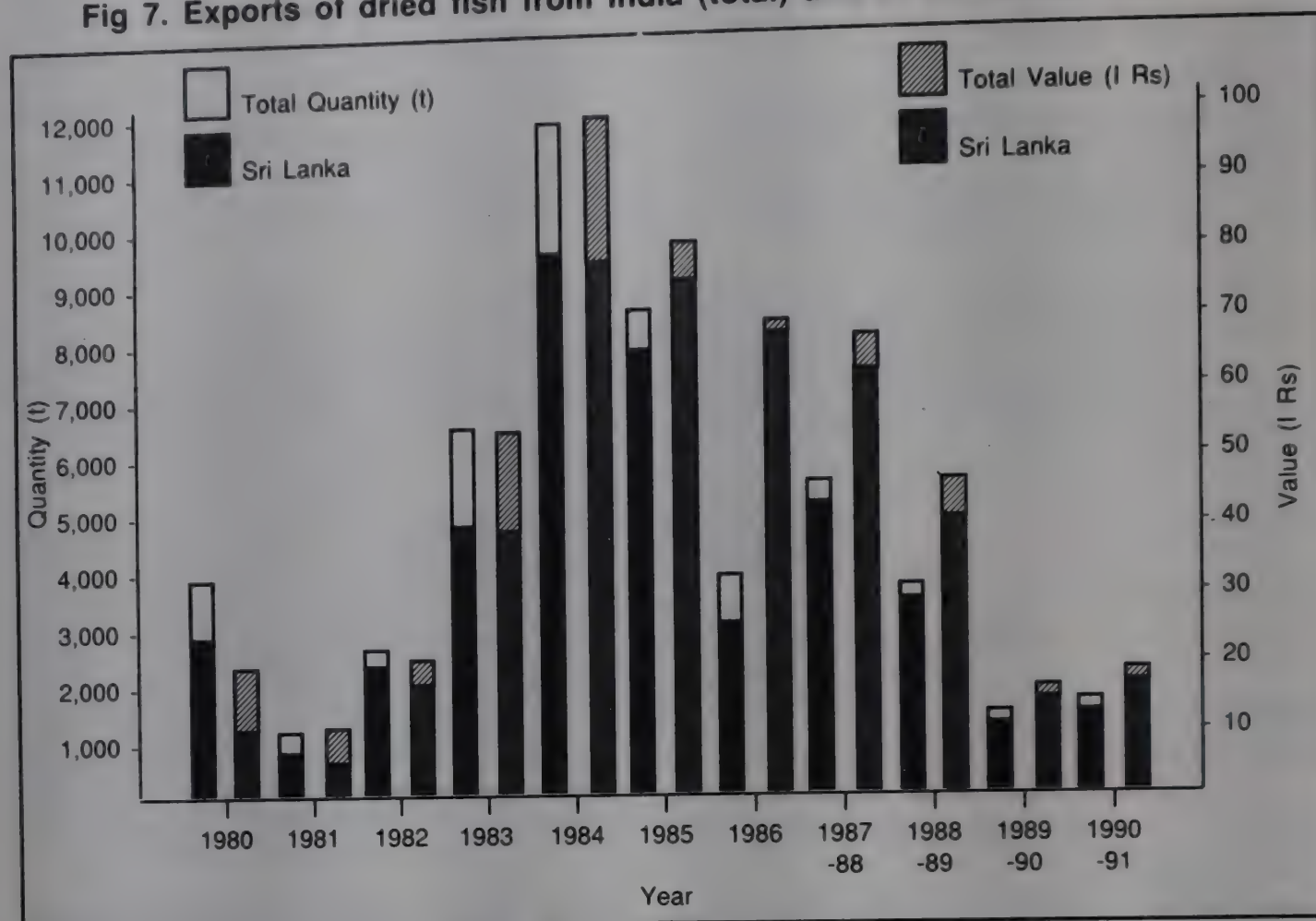
		81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	89/90	90/91
Fresh/live (mainly mud crab)	Q							84	424	619	654
	V							17.9	7.7	13.4	16.1
Frozen (shrimp, cuttlefish, lobster, fish, etc)	Q	4,073	4,451	9,105	7,569	7,996	12,531	9,416	11,049	16,472	25,187
	V	157.95	247.54	337.84	406.95	465.40	589.11	609.01	933.60	908.00	1,593.20
Dried fish	Q	602	2,274	6,845	11,045	9,235	5,207	4,103	3,522	1,051	1,067
	V	5.39	16.21	55.37	88.77	117.40	65.53	49.69	41.10	14.20	12.70
Shark fish	Q	99	100	99	95	142	210	183	221	245	124
	V	8.33	14.10	14.4	13.1	15.79	21.57	31.73	42.00	49.70	25.80
Beche de mer	Q	36	43	79	12	N.A.	N.A.	41	23	31	31
	V	0.91	2.63	4.1	1.15	—	—	6.66	5.00	8.40	4.30
Others	Q	23	3	57	71	49	104	—	92	90	268
	V	0.21	0.07	3.18	2.87	2.67	8.15	—	2.70	3.50	6.00
Total	Q	4,833	6,871	16,185	18,792	17,422	18,052	13,827	15,331	18,508	27,331
	V	172.79	280.55	414.89	512.84	601.26	684.26	715.08	1,032.10	997.20	1,658.10

N.A. = Not available
Q = Quantity in metric tons
V = Value in millions of I Rupees

Source: Tamil Nadu State Department of Fisheries, Madras

Sri Lanka is by far the most important export market for Indian dried fish products, with the capacity to generate some up to 100 million IRs/year (see Figure 7). Out of the total quantity of dry fish exports during the 1980s, just over 94 per cent were destined for Sri Lanka.

Fig 7. Exports of dried fish from India (total) and to Sri Lanka, 1980 - 91



Source: MPEDA exports statistics 1991

Note: Date for TOTAL exports for 1980-86 are on financial year basis, whereas exports to Sri Lanka during the same period are on calendar year basis. There are, therefore, slight discrepancies in the presentation.

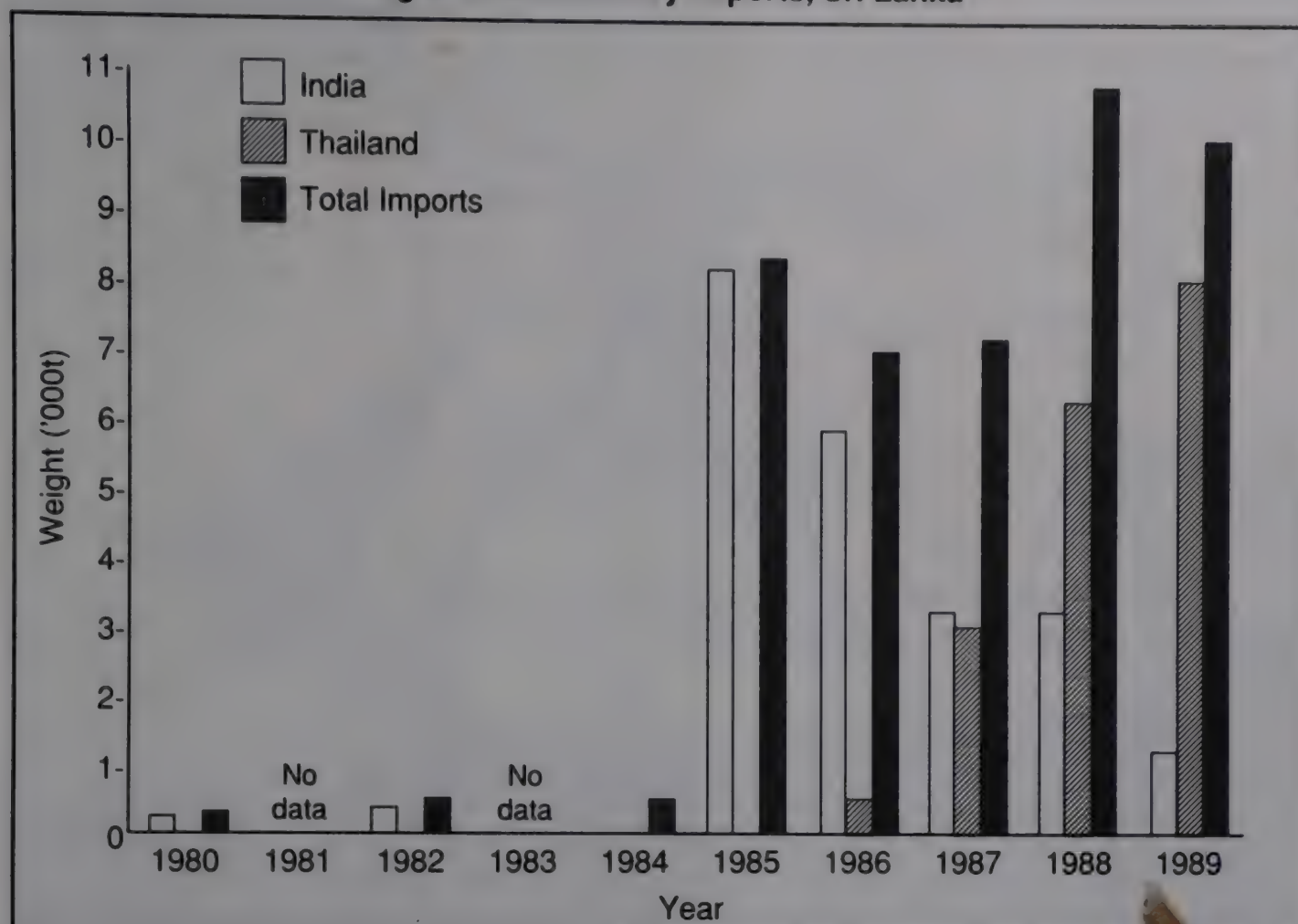
Data for dried fish exports (see Table 10 and Figure 7) show a dramatic surge during the mid-1980s which is of relevance to the present study. The peak primarily represents a great increase in the export of **dried Anchovy** to Sri Lanka, where traditional sources in the North and Northeast of that country had suffered considerable setbacks due to local political disturbances. Whereas for at least two decades dried Anchovy had represented about 50 per cent by weight of all dried fish exports to Sri Lanka from Tamil Nadu (M.P.E.P.C. 1972), during this period this percentage increased, probably upto 90 per cent or more. It then declined to a figure which is likely to be considerably less than the original. The reasons for this are further discussed and described in the pages that follow.

Recent data from Sri Lanka (see Table 11 and Figure 8 on facing page) covering the latter half of the last decade specifically show the increase followed by decline in Indian dried Anchovy imports into that country over this period. Whilst overall imports have tended to increase, the market share enjoyed by the Indian product has dropped from 97 per cent in 1985 to just 11 per cent in 1989.

It is now known from the market research carried out in India that the reasons for this are principally two-fold:

- The **poor quality of the Indian produce**; and
- The **introduction of a high quality Thai product** into the market at a competitive price during the mid-1980s. The implications of this are further discussed in subsequent pages (see 'The development of the Thai market in Sri Lanka').

Fig 8. Dried Anchovy imports, Sri Lanka



Source: Sri Lanka Customs, Colombo

Table 11: Imports of dried Anchovy (Sprats) into Sri Lanka from 1980 to 1989 (Kilograms; all values as CIF Colombo in SL Rupees)

	1980	1982	1984	1985	1986	1987	1988	1989 (Jan-Jul)	1989 (Aug-Dec)
India									
Weight (t)	207	318	0	8,039	5,792	3,258	3,307	1,106	24
Value (SL Rs. '000)	2,376	4,011	0	140,093	151,556	90,793	78,343	23,928	460
Price/kg	11.49	12.62		17.43	26.17	27.87	23.69	21.64	19.37
Thailand									
Weight (t)	0	0	0	0	474	2,831	6,194	4,168	3,911
Value (SL Rs. '000)	0	0	0	0	13,490	80,132	194,136	123,876	129,217
Price/kg					28.45	28.30	31.34	29.72	33.04
U A E									
Weight (t)	0	0	334	167	530	1,007	580	372	0
Value (SL Rs. '000)	0	0	7,027	2,985	15,360	21,939	13,606	9,511	—
Price/kg			21.02	17.82	28.96	21.78	23.46	25.58	—
Others									
Weight (t)	22	193	197	89	207	149	616	107	418
Value (SL Rs. '000)	353	4,259	3,617	3,509	6,750	3,241	20,439	2,996	12,972
Price/kg	16.18	22.06	18.35	39.62	32.64	21.77	33.20	28.05	31.02
Totals									
Tons (t)	229	511	531	8,295	7,003	7,245	10,697	5,753	4,353
Value	2,729	8,270	10,644	146,587	187,156	196,105	306,524	160,311	142,649
Avg. price	11.94	16.19	20.03	17.67	26.73	27.07	28.66	27.87	32.77

Source: Sri Lanka Customs, Colombo

Preferred species

The most preferred species of Indian dried Anchovy in Sri Lanka are:

- *Stolephorus devisi* (also known as *rama nethili* in Colombo, *neela nethili* in Tuticorin and *karu nethili* in Kanniyakumari) and
- *Stolephorus commersonii* (called *poruva* in Tamil), which ranks second in preference.

Stolephorus indicus (*vella nethli* in Tamil) is the least preferred species of Anchovy. The large-sized *Stolephorus devisi*, measuring about 7.7 cm, is the most preferred size in Sri Lanka. This comes mainly from the Karnataka coast.

The traditional channels of distribution in Sri Lanka are given in Figure 9. This is further discussed under Section 4.5 ('Sri Lankan markets').

Packaging and storage

Exporters normally store the dried Anchovy for about 45 days. In exceptional cases, when the demand is low, they may hold the product for up to six months. No insecticides are used on the fish to combat infestation. However, gunny sacks are sometimes treated with proprietary pesticides to prevent beetle infestation.

Dried Anchovy is usually packed in 25 kg gunny sacks lined with palmyrah mats. This is done to avoid breakage of the brittle product during transportation. Dried Anchovy from Tuticorin is usually despatched to Colombo by schooners. Sailing time is only about 8-10 hours.

Indian export traders

An association of Dried Fish Export Merchants exists in South India whose main role is to serve as a forum to deal with government and export regulations. The local chamber of commerce is also dominated by these merchants, with one being the President and another, the Secretary.

Most of these traders are Sri Lankan expatriates who came to India in the mid-40's and 50's. They have strong kinship ties with importers in Sri Lanka who are bound to them not only by economic ties but also by family bonds. The trend among the leading exporters is to have their own retail outlets in Sri Lanka run by relatives. This enables the exporters to have up-to-date information of market trends and prices and helps them to adjust their marketing strategies.

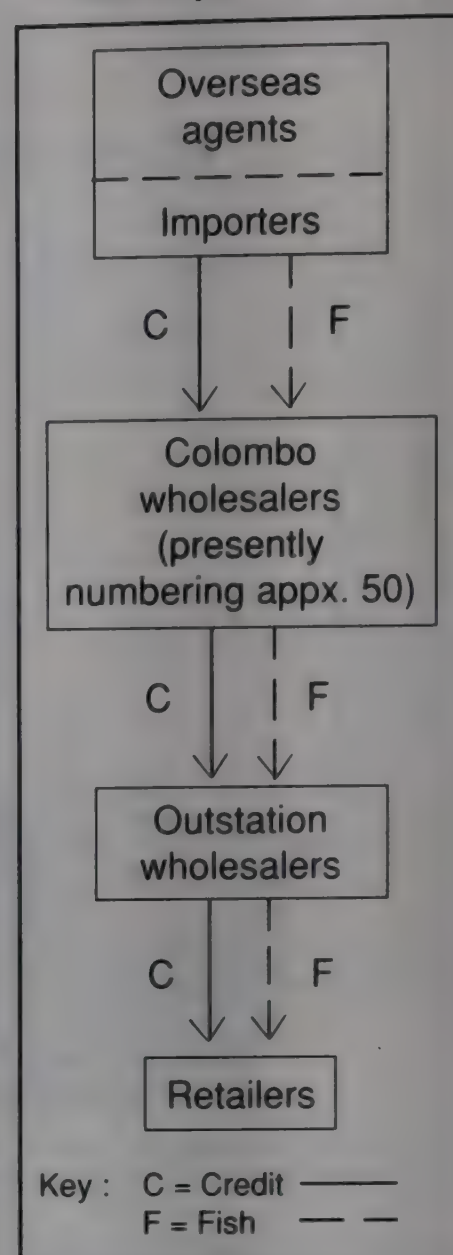
The major investment for these exporters is the construction and maintenance of storage godowns. In order to have maximum capacity utilization, they also deal in other commodities, such as smoked Tuna from the Lakshadweep Islands, onion, chillies, garlic, lentils and cashewnut. But dried Anchovy is their most important export commodity.

Sources of supply to the export market

Tuticorin in Chidambaranar District in southern Tamil Nadu is the major export centre for dried fish in India, exporting, between 1976 and 1986, over 47 per cent of the State's fish and fishery products.

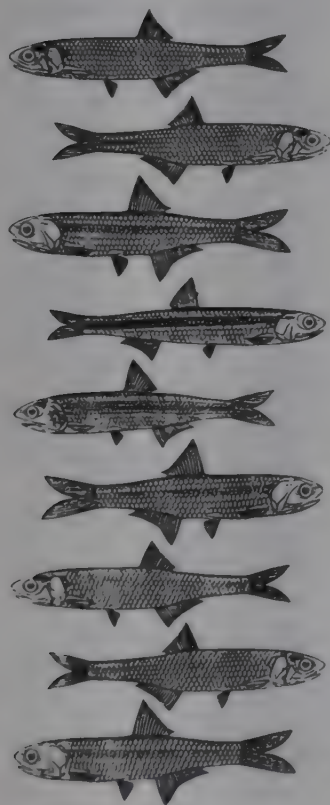
Up to 1980, Kanniyakumari District was the major internal supply source, accounting for up to 75 per cent of the total annual supply (see Table 6), but it has been overshadowed in recent years

Fig 9. Import and marketing channel for dried Anchovy in Sri Lanka





India exports more dried fish to Sri Lanka than to any other country. Much of this is still transported from Tuticorin to Colombo in traditional sailing schooners.



RACK DRIED ANCHOVY (NETHILI)

**A HIGH GRADE
EXPORT QUALITY
PRODUCT**

Nutritional information

- a high protein product (upto 81.5%) ideal for children
- rich in valuable fats, oils, minerals and vitamins
- hygienic and needs no further cleaning

Preparation

Simply prepare directly from the packet by frying or other favoured recipe

Makes a tasty and healthy snack to accompany drinks and cocktails

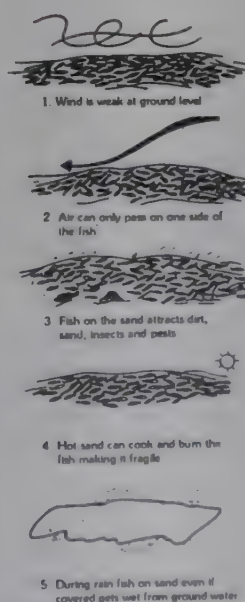
Enquiries to:

Anchovies or sprats, are amongst the most commonly landed fish along the Karnataka, Kerala and Tamil Nadu coasts.

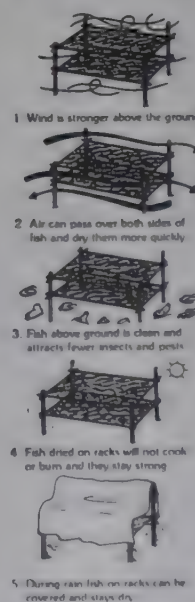
Due to poor traditional practices of drying anchovies directly on beach sand under often extremely insanitary conditions, product quality has tended to suffer

Improved processing techniques are gradually replacing the traditional sand drying method of processing anchovy. An improved "Solar-Rack" drying process has now been introduced into several production centres in S. India. This has enabled production of a high grade, export quality product which conforms to international quality standards for dried fish products.

Old method of sand



New method using drying racks



Could the poor image of the traditional dried Anchovy exported from India be improved through promotion amongst traders? The project has sought to address this question with leaflets such as this one.

by Mangalore and Allapuzha (Alleppey) due to the better quality product from these places (see Table 12).

Table 12: Source of supply for export

<i>Market Months</i>	<i>Area of landing</i>
May - July	Ramanathapuram District, Tamil Nadu.
July - September	Kanniyakumari District, Tamil Nadu
September - December	Allapuzha and Thiruvananthapuram (Kerala), Mangalore, Karwar and Udupi (Karnataka) and Ratnagiri (Maharashtra).

Source : Export Merchants, Tuticorin.

The development of the Thai market in Sri Lanka

Both Tables 13 (below) and 14 (on facing page) reveal that the unit value of the Indian product has suffered a severe downgradation relative to products from most other exporting nations, ranging from CIF values down the chain to retail. In the first half-year of 1989, the Indian product sold for just over three quarters of the Thai equivalent or, indeed, of the product imported from any of the countries listed.

Table 13: Imported dried Anchovy: comparative data on quantities and prices of some imported lots (first half-year 1989)

<i>Trader</i>	<i>Exporting</i>	<i>Quantity (t)</i>	<i>Total (%)</i>	<i>Prices (SL Rs/kg)</i>		
				<i>CIF Colombo</i>	<i>Wholesale</i>	<i>Retail</i>
1.	Thailand	37.0	3.0	29	55	58
2.	Thailand	71.0	5.6	31	58	60
3.	Thailand	88.0	7.0	33	56	60
4.	Thailand	18.0	1.4	32	58	60
5.	Thailand	669.3	53.3	29	58	60
6.	Thailand	40.0	3.2	33	55	60
7.	India	62.5	5.0	22	40	45
8.	India	37.5	3.0	22	55	58
9.	India	31.3	2.5	22	38	40
10.	India	43.8	3.5	22	40	45
11.	India	75.0	6.0	22	38	42
12.	India	17.5	1.4	22	40	45
13.	UAE	38.5	3.1	22	52	55
14.	Saudi Arabia	8.2	0.7	29	55	58
15.	Singapore	16.5	1.3	27	52	55
Total		1254.1	100.0			
Weighted averages:						
India		267.6	21.3	22.00	41.31	45.40
Thailand		923.3	73.6	29.77	57.56	59.92

Source: 1. Sri Lanka Customs Office
2. Ministry of Fisheries Planning Department, Sri Lanka
3. Dry fish traders, Colombo

**Table 14: Price structure of dried Anchovy in Sri Lanka
(November 1991 in IRs/kg)**

		THAI		INDIAN	
	Grade I	Grade II	Grade III	Grade I	Grade II
CIF Colombo	24	21	18	18	15
Wholesale Cmb.	36-40	30-36	28-30	19.80	17
Wholesale outstation	36-48	30-42	29-35	21-24	19.5
Retail	39-72	36-66	32-50	30-45	28

Source : Wholesalers and retailers in Sri Lanka;
Report on visit to Sri Lanka (BOBP/KDFSF 1992)

Note : Outstation wholesale and retail prices increase with increasing distance from Colombo.

A simple comparison of Indian product with the Thai reveals the reasons for the lower price of the Indian product. A summary of the more important organoleptic differences between these products is provided below.

Table 15: Organoleptic quality comparison between Indian and Thai dried Anchovy at wholesale

	Indian	Thai
Odour	Pungent rancid notes	Fresh typical dried fish odour, slight rancid note.
Appearance	Dark orange to yellow colour, fragmented, brittle, many loose heads, much adhering sand particles and extraneous matter.	Pale, little waste material, no adhering sand, firm and pliable.
Flavour	Not salty	Slightly salty
Packaging	Variable sized woven baskets and gunnies (baskets ‘protection for brittle product’)	White woven 20 kg polypropylene sacks with manufacturer’s logo, telephone and fax numbers in single/two colour printing, cross-sewn at seam.
Infestation	Beetle much in evidence in several samples.	None

Traders are quick to indicate that the broken heads and extraneous material, especially adhering sand, detract from customer appeal as well as provide poor value for money when considering the loss in useful weight. It appears that the Sri Lankan consumer is well aware of these facts.

According to Sri Lankan trade sources, dried Anchovy from Thailand is available all year round, with a peak season from mid-January to mid-March. The product is made on racks after being dipped in a brine, hence the product is sand-free and slightly salty to taste. Up to four qualities (Grades I to IV) are recognizable, these depending upon such criteria as colour, dryness etc.

The preferred species from Thailand is black Anchovy, reportedly similar to *Stolephorus devisi*, and the preferred source is south Thailand rather than the north and east as the storage life is reported to be longer.

Factors favouring re-establishment in the Indian export market

Most Sri Lankan traders regret the demise of the Indian supply for several reasons, predominant among which is the fact that many have family ties with South Indian Tamil traders with whom they have traditionally enjoyed good trading relationships. Other points in favour of the Indian product include:

- Short and economical transport distance, compared with Southeast Asia;
- No salt added (and, therefore, preferred by traders who feel that saltless Anchovy have a longer shelf life);
- Indian product reportedly has a better flavour due to a higher oil content.

The last two claims are, however, subjective comments and, therefore, difficult to substantiate.

3.3 The market for dried Anchovy for animal feeds

Anchovy is sold in 'trash' form as poultry feed and manure. The poultry feed market is the biggest market in terms of turnover of dried Anchovy. It is estimated that 60 per cent (equal to 6000 t) of the total Anchovy landings in Tamil Nadu is taken for poultry feed (*source*: local merchants).

Kovilpatti (530 km south of Madras) and Villupuram (160 km south of Madras) are the major collection centers catering to this market (see Figure 8). Kovilpatti is the largest wholesale market for headless Anchovy with its main supply coming from Kanniyakumari District. Namakkal (370 km southwest of Madras) in Salem District is the most important consumer centre due to the large number of poultry farms situated in this area.

Quality is not important in this market as it essentially deals with Anchovy of very poor quality as trash fish. Fish heads and even powder — 'Frass' — resulting from extensive insect infestation, find their way to this market. However, in some small markets even low quality dried Anchovy, which normally would be used for animal feeds, may be sold for human consumption due to lack of supply and a better quality product.

Current (1991) prices in this market are 1-5 IRs/kg for Anchovy from Kanniyakumari and 5-7 IRs/kg for Anchovy from Ramanathapuram. Prices are heavily dependent upon the current supply and demand requirements of the Indian poultry producers for fishmeal-based feed stuffs. There is also a variation due to the extent of insect infestation and the quantity of extraneous material, especially sand.

4. THE DEVELOPMENT PROGRAMME

4.1 Hypothesis and approach

The basic assumption made prior to establishing the development activity was that **an improvement in the quality of the dried product would yield dividends both in terms of better revenue to the producers, and diversification of the market.** Of initial high priority was the possibility of re-establishing the large export market to Sri Lanka.

Bearing in mind much of the data presented earlier, this would appear to be a fairly safe hypothesis with clear prospects for development. However, in order to provide positive evidence, it was decided to carry out pilot-scale production and market research in several producing villages in Kanniyakumari District. This would both test the socio-economic and technical aspects of the simple drying rack technology proposed, as well as well as provide high quality product for test marketing. Having once established that a value-added market does indeed exist, the scene would then be set to promote the improved technology and marketing methodology in a wider constituency.

4.2 Establishing initial technical feasibility of rack drying

At the request of the KDFSf, a preliminary trial, to process high quality Anchovy using a rack system, was conducted with the assistance of BOBP and CIFT in 1990. The objectives of the rack system were to produce a hygienic, sand-free and efficiently dried product which would satisfy the quality criteria of the more discerning national and international buyers. This would help to reduce the existing heavy economic losses discussed earlier (see Section 1). Importantly, and in order to make it attractive to the target group, the cost of the technical intervention would have to be considerably less than the financial benefits which would eventually accrue to the producers.



Fishermen's workshops: participation in both design and implementation of the Project played an essential role from the start

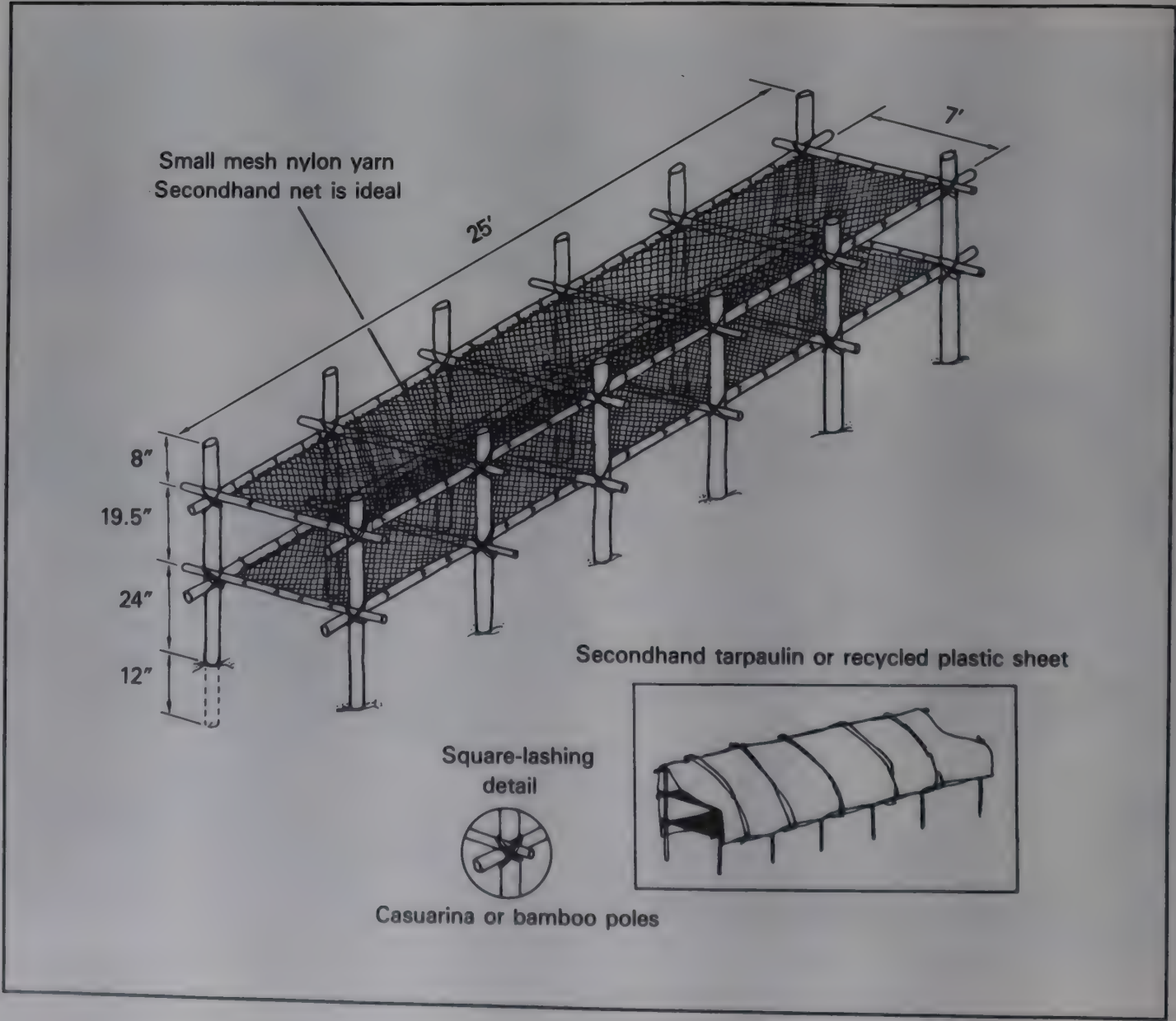
4.2.1 THE DRYING RACK SYSTEM

As a result, a simple casuarina/gillnet drying rack system was developed (see Figure 10). This can be made quickly and at little cost from local materials. A cost breakdown for a family-operated rack unit measuring 25' x 7' with two tiers capable of accommodating 100 kg of wet fish, is given in Section 5 (Tables 21 to 23). At a total cost of Rs.1484/- (including ancilliary costs such as washing baskets), the payback period of a single rack drying unit operated by a fisherman family appears to be extremely short at about **18-28 days**.

The technical advantages afforded by the rack system in comparison with the traditional drying method may be summarized as follows:

Rack	Traditional
No sand adheres to fish	Up to 22 per cent sand adheres to fish.
Low risk of contamination from environmental filth	High risk of contamination
Efficient drying from both sides	Inefficient drying especially under humid conditions
Rain protection using cover	Rain protection impossible
Low temperature drying gives strong product and less discolouration	Product cools on sand and becomes fragile. Tendency to discolour.

Fig 10. Anchovy drying rack



4.3 Pilot production trials

4.3.1 SELECTION OF SITES AND THE TARGET GROUPS

The artisanal fishermen of Tamil Nadu primarily concerned with Anchovy fishing represent some of the least well-off members of the small-scale fishing community (see Section 1). A large proportion are indebted to private creditors, and opportunities for alternative employment during lean seasons are limited.

Whereas in many districts of Tamil Nadu this situation has altered little over a long time, in Kanniyakumari District the KDFSf has played a significant role in alleviating these problems, albeit amongst a small percentage of active fishermen. The *sangams* maintain an organic link with the fishing communities and their activities directly reflect the needs of the artisanal fishermen (ODI, 1991). The KDFSf's supportive role, helping the *sangams* to develop policy and coordinating donor agency funding, means that it is essentially different from other NGOs. Having developed in response to the growing need to address the several issues of the *sangams*, its focus is wholly dedicated to its fishermen constituency.

The presence of such a successful and active NGO in the field, and especially one which had raised the issue of the many problems associated with Anchovy drying by its *sangam* members, makes



Communal drying racks, used in a trial during the 1990 season in Kovalam, Tamil Nadu, are shown here covered during seasonal showers.

the selection of site relatively simple. Past BOBP experiences with KDFS (for example, construction and implementation of a permanent ice-box — PIB — programme in Kanniyakumari) had also yielded positive benefits both to Federation Staff and the four target *sangams* involved in the PIB project.

Initial pilot activities were, therefore, implemented during the 1991 season at Kovalam and Melmanakudy villages through the Federation in the Kanniyakumari District. Work was carried out on a fully participatory basis, whereby the *sangam* members were encouraged throughout to become actively involved in decision-making, project design, technical development, processing, market analysis etc. Several field training workshops were held within the communities, covering such aspects as drying techniques, quality control and flake making. For these reasons, the project sought to reflect substantially the needs of the target groups.

4.3.2 OBJECTIVES OF THE PILOT STUDY

The objectives of the pilot study, of the simple rack drying techniques introduced, were:

- To demonstrate and standardize the production methods for an improved quality, hygienically produced, sand-free dried Anchovy at the fisherman family level, which could result in considerable increases in financial returns to this producer group;
- To produce enough material to carry out market studies in Sri Lanka and estimate the potential for re-establishing the demand, there for the Indian product (see Section 3.2 *et seq.*); and
- To study the potential for developing new markets, both internally and abroad, for high quality Anchovy.

4.3.3 TRIAL VILLAGES

The *sangams* of Kovalam and Melmanakudy villages (see Figure 1) were selected because of

- Expressed needs of fishermen through the *sangam*/KDFS for help in improving quality and marketing of dried Anchovy;
- Proximity of space to put racks by landing sites;
- Previous experience with earlier trials on test drying racks;
- Assumed availability of fresh water, if required;
- Availability of voluntary labour; and
- Fishermen and *sangams* from these villages showing interest in the trial proposals and willingly offering areas for work and raw materials for trial purposes.

4.3.4 ORGANIZATIONAL ASPECTS OF THE PILOT STUDY

Melmanakudy had previously offered its godown premises and shown willingness to construct racks for the technical tests carried out in 1990. The offer was made again for the 1991 trials. The Melmanakudy *sangam* committee agreed to supply raw material for the trials by purchasing Anchovy from *sangam* members, later distributing any profits from the sale of the trial product equitably to all members. Certain capital and operating costs, such as for labour and supply and construction of racks and accessories, were to be provided by the project.

In Kovalam, the *sangam* organized raw material to be supplied by individual members once the early morning price for fresh Anchovy came down. Soon after landing, fishermen traditionally get from merchants one-third of the price of the dried Anchovy to be purchased. This amount provides for their day-to-day expenses. Hence, for the duration of the trials, it was decided to also advance a small amount to members soon after supply was made.

This amount was advanced by the KDFSf and, later, deducted from the income after the trial product was sold. The wages for labourers, supervisors and watchmen, and the cost of racks and accessories for the trials, were to be met by the project. The members of the *sangam* were involved in the purchase of the accessories for the racks and the racks were constructed by them.

In each village, a **communal drying unit**, comprising five rack units, each of which measured 25' x 7' and two tiers, was constructed (see Figure 10). Each tier of a unit could dry 100 kg of Anchovy, as demonstrated during BOBP/CIFT's previous technical trials. The drying was over 1½-2 days.

4.3.5 PILOT PRODUCTION

The trial production quantities decided upon were approximately 5 - 10 t over a three-month season, based on drying 100 - 200 kg of Anchovy on each of ten racks (2/village) with a drying time of two days and a raw material-end product ratio of 1:0.33 (*i.e.* 33 per cent yield in weight).

However, the Anchovy season for 1991 was considered to be particularly poor and landings at both villages were meagre and sporadic. Because of the reduced supply, demand for fresh Anchovy was considerable and, so, most fish landed was destined for this market.

Actual production achieved was as follows:

Total quantity of fresh Anchovy processed	Kg 3,416 (appx.)
Head-on	155
Head-off	234
Flake	271
Mixed	385
Waste and low grade	68
Total dried product sold	1,113

Despite the less-than-expected levels of production by the project itself, a significant outcome of the work was that individual fishermen also, under the guidance of the project staff, constructed drying racks for their own use. These racks were put up individually or jointly by kin and friends. At the time the trial was completed there were about 15 racks of varying sizes from 8' x 5' to 30' x 8'.

The material used for putting up these racks, such as poles and net, were all available with the fishermen as accessories for their fishing activities. Some fishermen used recycled polyethylene rice bags to store the Anchovy. The racks were constructed in the space available in front of their houses. This saved time and made supervising the drying easier. The fishermen's family members — both men and women — and fishing unit hands processed the Anchovy.

An important lesson learned from the latter development was that, clearly, **one rack, one individual** was the most favoured option with the communal rack system not being liked by the fishermen. There was also a developing sense of competition noted between the individuals to produce better quality. This aspect is essential to obtain high quality and for better prices.

4.3.6 PROCESSING AND OPERATIONAL PERFORMANCE OF THE RACKS

Apart from a few minor modifications, the racks were found to be ideally suited for their purpose. Among several modifications adopted were:

- Replacement of 0.5 mm small mesh net originally used with 2 mm yarn variety, using twine to hold the net taut.

- Modification of processing method: Whereas, it had been originally intended to wash the Anchovy twice in fresh water containing salt, fresh water was not in good supply in the villages. The following method was therefore adopted (see also Appendix I):
 - Soon after landing, the Anchovy were placed in strong cane baskets that had handles and were washed in clean sea water to remove all the sand.
 - Drying began as early as possible in the morning, ideally with first landings. Thus, there was the advantage of a full day's drying. However, under normal conditions, the first of the landings commands a premium price, being sought for the fresh fish markets, and should not be used for drying. As the supplies increase and the morning moves on, the demand for fresh Anchovy quickly becomes saturated and prices drop sufficiently to make drying the only viable processing option.
 - Drying at the rate of 100 kg of wet fish per rack unit took a minimum of 4-7 hours under ideal conditions of strong sunshine and wind. During rainy periods, the racks were covered with plastic sheets to prevent dampening of the product, but air and wind were allowed to circulate freely so as to encourage as rapid a possible rate of drying. The drying times of the upper and lower tiers varied, with the top tier usually drying quicker by about three hours due to the greater incidence of sunlight. It was noted that there was a difference in the colour of the dried Anchovy between the upper and lower tiers. The dried Anchovy from the lower tier were of slightly lighter colour than those from the upper tier.
 - After drying in the hot sunshine, the Anchovy were spread on a palmyrah mats to cool in the shade, after which they were packed.

Further ways of improving drying efficiency could include:

- The use of second-hand industrial purse seine net as a cheaper, alternative surface material;
- Use of three tiers rather than two to increase the drying surface area, especially where beach space is limited;
- The use of industrial, low-grade recycled polyethylene covers for low-cost rain protection; and
- Good site selection. Drying capacity per unit surface area is dependent on the trial site. Sunlight, humidity and velocity of the prevailing winds are the key factors affecting the drying rate.

4.3.7 ANCHOVY FLAKES

Traditionally, 'flakes' are prepared in these villages by fisherwomen at home, prior to cooking. They use whole dried Anchovy and, using their fingernails, remove the scales, head, gut and backbone to make the flakes. Towards the final stages of the pilot study, an attempt was made to get the fishermen to prepare high quality flakes from rack-dried Anchovy. The intention was to see whether a value-added product would result.

Initial processing trials using local women labour (see Appendix I) were very successful. The resultant, high quality flakes clearly demonstrated improved organoleptic properties as compared to the traditional. Cooking trials carried out in the villages gave a positive response in favour of the product. Furthermore, *ad hoc* small-scale, local marketing testing produced a very favourable reaction (see Section 4.4).

In anticipation of the potential for value-addition and for generation of women's employment, further trials-cum-training workshops were conducted in Kovalam village in order to standardize production methods and produce material for market testing.

The production yield of flakes was found to be approximately 55 per cent of the weight of the dry (head off) raw material. A further 25 per cent was reclaimed as waste material and could be sold for animal feeds. With an indicative potential market price of over 100 Rs/kg, this appeared to be an extremely attractive proposition, especially given the labour-intensive nature of the process. This factor, however, also serves to limit large-scale production. The production rate per woman day (8 hours) was only 500 g. Profitability, it would appear from this, is likely to be extremely sensitive to labour inputs.

4.3.8 QUALITY ANALYSIS

Table 16 provides data on product analysis. The following characteristics of the different products tested may be seen from it:

- High sand (and, hence, ash) content of beach dried, traditional product;
- High salt content (and, hence, ash) of Thai products;
- Extremely high protein content of flakes; and
- High moisture content of Thai Grade II product due to hygroscopic effect of high salt content.

Table 16: Chemical and nutritional analysis of dried Anchovy products (dry weight basis)

Sample	Moisture (%)	Protein	Ash	Fat	Sand	Salt
			(% dry weight basis)			
1. Rack-dried White Anchovy	8.33	78.02	15.33	2.91	—	—
2. Rack-dried White Anchovy	13.36	73.56	17.19	6.88	—	0.77
3. Sand-dried White Anchovy	10.35	69.66	21.74	8.04	10.59	0.41
4. Sand-dried White Anchovy	11.16	61.14	33.84	6.57	15.45	—
5. Rack-dried White Anchovy	9.39	78.23	16.55	4.04	1.10	—
6. Thailand Grade II	16.17	73.87	20.89	4.75	1.79	8.96
7. Thailand Grade I	11.46	76.16	16.95	6.44	0.56	2.27
8. Flakes	8.20	88.8	8.18	8.17	2.18	—

Notes : a) % Ash includes sand and salt.
b) % Protein = Total Nitrogen x 6.25
c) "Moisture-free" data allows clearer comparison of product composition.

Source: Samples provided to and analyzed by CIFT (Kochi)

4.4 Pilot marketing trials

Market testing using the material indicated in Table 17 (overleaf) was divided into several areas:

- Local *ad hoc* test marketing;
- Madras markets;
- Sri Lanka market; and
- Other export markets

Owing to the lack of material due to the poor fishing season, it was impossible to set up long-term supply channels. The feedback from the trade can, therefore, only be regarded as indicative.

Comparative data on prices obtained for the traditional product, sold by the two target villages during the 1991/92 season, have already been given in Section 1. Table 17 calculates the 'what would have been' income by assuming a sales price of 7.30 Rs/kg for a traditionally dried equivalent weight of Anchovy. The overall indication is of a seven-fold price advantage for the value-added products. Costs of production are, however, not included in these figures.

Table 17: Pilot production and sales prices achieved for dried Anchovy products

<i>Product type</i>	<i>Total sold (kg)</i>	<i>Total revenue (Rs)</i>	<i>Rs/kg (weighted)</i>	<i>Remarks</i>
Head-on	155	5,007	32.32	<i>S.commersonii</i> <i>S.devisi</i>
Head-off	234	7,525	32.32	<i>S.commersonii</i>
Flake	271	32,423	126.93	<i>S.commersonii</i>
Mixed	385	9,600	24.94	<i>S.commersonii</i> <i>S.indicus</i>
Waste and low grade	68	414	6.09	
Total	1,113	54,969	49.4	
Equivalent weight fresh Anchovy		3,416		
Comparison with traditional product equivalent price		<i>Dried</i>	<i>Revenue</i>	<i>Average</i>
Total		1,083	7,905	7.30

4.4.1 LOCAL TEST MARKETING

Small-scale market testing was carried out initially in Nagercoil and Thiruvananthapuram. Product was packed in 50/100/250 g polyethylene bags with labelling and offered to several retail outlets in these major towns. The wholesale prices achieved for head-on and head-less ranged from 45-70 Rs/kg during the production season and 100-120 Rs/kg for flakes. Significantly, repeat purchase has been well established in one or two outlets in Nagercoil, with supply being made from private fishermen trained through the project's activities.

4.4.2 MADRAS MARKETS

Most large-scale merchants, despite being impressed by the quality, were prepared to pay no more than 20 Rs/kg for the improved quality head-off product (*i.e.* an identical price to the existing Grade I product). This rate further reduced as more Anchovy from Thiruvananthapuram and Mangalore started coming in (see also Table 8). This conservative response was expected as these traders would not be in a position to evaluate any value-added benefit in the better quality product. Retail markets in Madras, especially large departmental stores were, however, very interested in the product and suggested that suitable consumer packaging be developed as a prerequisite step.

One less conservative local dealer requested the first consignment of nearly 600 kg, which was sold to him at the rate of 30 Rs/kg. This was subsequently redistributed in Madras and sold at several retail outlets.

4.4.3 MARKET POTENTIAL IN SRI LANKA

In order to assess the Sri Lanka market reaction to the products, samples of head-on, head-off and flake were shown to importers and traders at all levels of the Sri Lankan market (see Figure 9). The opinions gathered are summarized below. Actual price of dried Anchovy in the markets at the time are given in Table 14.

4.4.4 IMPORTERS

The importers felt that the **black Anchovy**, though small in size, was of suitable quality for marketing. However, they suggested that the Anchovy be graded by size, as mixing of sizes would lead to the merchant reducing the prices.

Poruman Anchovy with head was liked by some importers, who felt that the white colour would help it sell well in the market. However, some felt that the presence of scales would inhibit buyers. They were of the opinion that Poruman would sell for SL Rs.2 - Rs.5 less than the black. The vast majority of the importers felt that the **headless Anchovy** would normally not sell, but, in times of demand, it might be possible to sell it.

The **Anchovy flakes**, according to importers, would not sell well in the local market. One importer, however, felt that this was a high quality product which would have good export potential to Singapore besides catering to local upper class market segments.

4.4.5 WHOLESALE

The wholesalers, by and large, felt that the **Black Anchovy** was of the right quality. The common opinion expressed was that it would sell initially for a price equivalent to that of the Thai product but would then increase as the trade recognized the value-added benefit. However, they also felt that the Anchovy needed to be graded by size, instead of being a mix of all sizes. One wholesaler felt that more attention was needed to be given to the bulk packaging. He felt that even inferior Thai Anchovy was sold because of the attractive packaging (two-colour printed polypropylene woven sacks). He felt that shelf-life was of paramount importance in order for the product to capture the market.

Opinions about the **Poruman Anchovy** were varied. Some wholesalers felt that this Anchovy would not sell in the market. However, at Galle market and in northern markets such as Anuradhapura, the wholesalers felt that Poruman would sell if Thai Anchovy happened to be in short supply.

Headless Anchovy was also liked in some markets, especially Negombo and Kurunegala. Here, headless was already being sold and, hence, there was a greater degree of product acceptance.

Flakes, by and large, did not interest the wholesalers, except for one or two who felt that it was tasty and might possibly have a limited local market.

4.4.6 RETAILERS

The **Black Anchovy** was well received by the retailers. They, however, said that the size was smaller than the product they usually dealt in. According to them, quality-wise and price-wise, the sample product could be treated on par with the top quality Thai product.

Retailers emphasized the importance of packaging. They felt that the consumer's decision to buy was influenced to a great extent by the colour of the Anchovy and the appearance of the product package.

Poruman Anchovy was, by and large, regarded as inferior to black. The majority of the retailers felt that it would retail for SLRs.2 - 5 less than the black. At Galle, however, the retailers felt that the white colour of Poruman would attract the consumers.

At two or three centres, notably Kurunegala and Galle, retailers liked the **headless Anchovy**. They were familiar with this product and, hence, could easily accept the product and set a price.

Flakes attracted positive response only in the up-market retail stores. Retailers catering to middle and low income groups felt that this product would not evoke much interest among their customers.

4.4.7 OTHER EXPORT MARKETS

Sample products were exhibited at the 6th International Seafood Trade Fair organized by MPEDA and held in Kochi, India (February 7-9, 1992). This elicited several enquiries from export buyers followed by firm quotations for orders. Some details of these are given in Table 18

Table 18: Price quotations for Anchovy products from exporters (April - August 1992)

<i>Product</i>	<i>Market</i>	<i>Price</i>	<i>Equiv. IRs.</i>	<i>Freight</i>
Head-on	Singapore	S \$2.40	43.96	6.26
	Oman/Dubai	—	40.00	(FOB)
	Sri Lanka	—	25.00	(FOB)
Head-off	Singapore	S \$2.60	47.63	6.26
	Oman/Dubai	—	35.00	(FOB)
Flakes	Singapore	S \$4.50	82.44	6.26
	Oman/Dubai	—	130.00	(FOB)

Sources: i) Private trader, Singapore.
ii) Exporters to West Asia.
iii) Sri Lankan exporters.

4.5 Synopsis of market potential

4.5.1 DOMESTIC MARKETS

Results of the trials described indicate that the market potential is good, but that a certain amount of promotional activity may be required in order to really attain high value markets, especially for the flake products.

Despite the current market's reservations, a piece of market research into fish consumption carried out in Madras appears to clearly indicate the good potential for value-addition, with premium prices being possible for higher quality products (BOBP/WP/83, 1992). Although this was primarily oriented towards the identification of fresh fish consumption patterns, some interesting observa-

tions were also made on consumer attitudes towards dried fish in general, as well as levels and frequency of consumption. As dried Anchovy is one of the most important dried fish consumed in Madras in terms of volumes, it can be reasonably assumed that the comments made on dried fish in general have an important bearing on this product.

Significantly, on a sample of 2,527 Madras households, 75 per cent of all respondents indicated they had consumed dried fish during the previous six months. Moreover, there was much less difference than expected between the responses of varying income levels: 83 per cent for income groups of upto 500 Rs/month ranging down to 55 per cent for those with incomes greater than 4000 Rs/month.

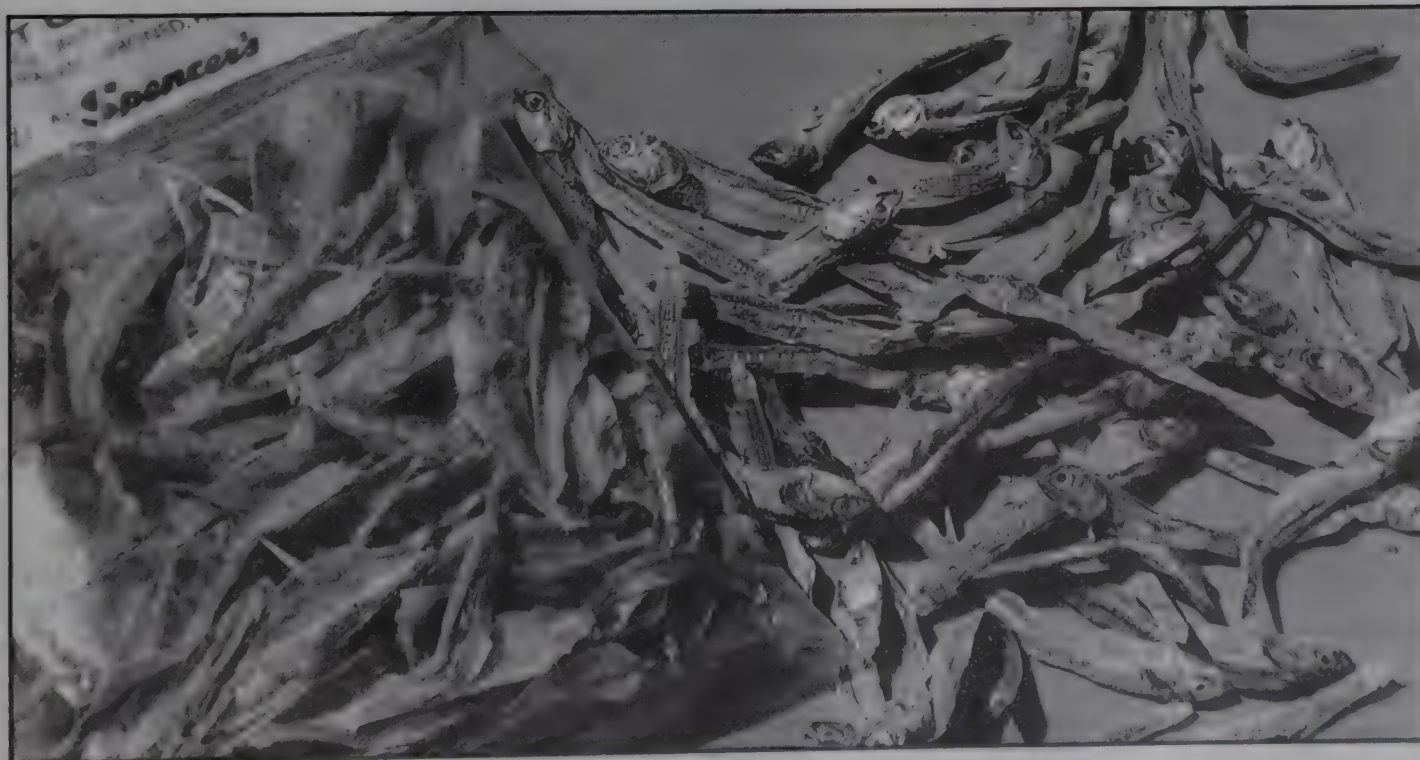
This high level of appreciation of dried fish amongst all income levels, rather than just on the lower socio-economic groups, indicates the potential for value-addition, a fact which was verified through subsequent qualitative focus group analysis of respondents' opinions of these products. This clearly confirmed that dried fish was liked by all fish consumers, both in terms of taste and convenience (especially storability). However, a **poor status value** is associated with its consumption and this factor, combined with certain practical difficulties, such as bad smell (associated with poor quality), tend to restrict consumption. Quality improvements were thought to be of vital importance in taking care of these current perceptions and enhancing status value. Improved packaging and promotion emphasizing preparation and handling would enhance consumers' interest.

Further market research is currently underway (mid-1992) to investigate more thoroughly consumer responses to high quality Anchovy products.

4.5.2 EXPORT MARKETS

It seems clear that the high quality products are well received overseas, especially in countries where dried fish is traditionally consumed. If bulk export markets can be established relatively easily, then, in the short term, these may offer better returns than domestic markets. However, given the potential size of the latter, effort must be focused on its development.

Somewhat contrary to expectations, the market for the products in Sri Lanka is probably limited to the head-on variety, although, as with the Indian domestic market, flakes sales may well develop with promotional activity. Prices also appear to be fairly low and reflect the large volumes and intense competition.



Anchovy flakes (packet) and head-on varieties would appear to offer the best potential for export.

5. DEVELOPMENT PROPOSALS: DESCRIPTION AND ECONOMIC APPRAISAL

5.1 Introduction

The pilot trials have demonstrated that:

- Several value-added marketing options appear to exist which have the potential of boosting incomes of small-scale producers and generating valuable employment opportunities for groups of women;
- The technology is simple and efficient in terms of producing a high quality product at a low cost; and
- The social organization required to accomplish a better quality product is within the scope of the *sangams* with support from the KDFSf.

Proposals are, therefore, now made to promote an increase in the production of sand-free, rack-dried head-on, head-off and flaked Anchovy. This would be achieved through the provision of support to the KDFSf in organizing a series of fishermen family-based rack drying operations with a centralized administration, packing, marketing and distribution system. In addition, flake-making by women could be carried out at the community level, controlled by both the *sangams* and coordinated through the central administration. The organization structure proposed is given in Appendix II and its operational details are further discussed in the following pages. In order to gain insight into the commercial potential of this proposal, a cost model is presented. This starts by making an estimate of the potential production of Anchovy in several selected villages in the Kanniyakumari District and is followed by a description and simple economic assessment of the drying rack basic operational unit (Tables 19 to 23). This improved drying system is then directly compared to the traditional drying method, *i.e.* directly on the sand (Table 24).

Having identified the financial benefits that the drying rack unit has over the traditional practice, an analysis has been made of a **community-based, multi-product manufacturing operation** (Tables 25 to 29). This comprises a series of drying racks at the village level, a centralized godown for reception, repacking and quality control, and a number of flake processing units (FPU) run by women at the village level. The main responsibility for the initial management and administration will lie with the KDFSf. Following the description of the multi-product operation, a financial analysis based on Internal Rate of Return (IRR) is presented along with details of the proposed financial plan (Tables 30 and 31). The whole operation is summarized for convenience (Table 32).

Much of the data and parameters in the model are, of course, variable. Those presented in the tables can be considered as being 'those most likely to occur' and have been derived primarily from the information obtained over the last two years of pilot production and study reported on under Sections 1-4. However, in order to test a range of conditions, sensitivity analysis has been carried out, the results of which are provided in Table 33.

Each table will be discussed in detail in the following pages.

5.2 The Anchovy resource in Kanniyakumari District

As no studies have, to our knowledge, been carried out on the resource status for Anchovy, village-level 'production estimates' have been obtained primarily through interviews with active fishermen, traders and others involved in this sector. The main reason for including these data is to demonstrate that resource availability should not be a constraint to the project proposal.

Tables 19 and 20: The information presented covers Anchovy catches either by gillnetting or beach seining in eight villages. It can be seen that by far the greatest emphasis is placed on the use of gillnets; in fact, as reported earlier, information suggests that the beach seine is in decline.

The total quantities estimated would appear to be somewhat at variance with those given by the SIFFS study of ten villages during the '88-'89 season (see Section 1, Table 2). This variation might in part be due to the fact that landing centres in the Kanniyakumari District covered by the SIFF's sample survey were not all principal Anchovy landing centres.

Table 19: Estimated maximum seinenet production of head-on Anchovy by *sangam* members in four sample villages

<i>Village</i>	<i>Members' nets</i>	<i>Avg. yield per village per day (kg)</i>	<i>Fishing season (days)</i>	<i>Production potential (t)</i>
Kottilpadu	3	7,000	60	420
Melmidalam	4	9,333	60	560
Keezhmidalam	2	4,667	60	280
Pallam	2	4,667	60	280
Total	11	25,667		1,540

Sources: Fishermen, traders and KSS *sangam* in each village.

Table 20: Estimated maximum production of gillnet head-off Anchovy by *sangam* members in eight sample villages

<i>Village</i>	<i>Members' nets</i>	<i>Yields per village/day (kg)</i>	<i>Fishing season (days)</i>	<i>Production potential (t/season)</i>
Enayam	100	5,000	30	150
Melmidalam	45	4,500	30	135
Keezhmidalam	30	4,500	30	135
Kottilpadu	25	5,000	90	450
Pallam	50	10,000	50	500
Melmanakudy	150	30,000	60	1,800
Keezhmanakudy	75	15,000	60	900
Kovalam	60	24,000	90	2,160
Total	535	98,000		6,230

Sources: Fishermen, traders and KSS *sangam* records.

5.3 Cost of rack drying system

The cost of using drying racks is presented here, along with certain assumptions with regard to operating conditons.

Table 21 indicates the assumed operating conditions of a single fisherman family drying rack unit as shown in Figure 10. Data used here have been obtained from trials undertaken over the previous two years. The size of the rack itself has been determined as most appropriate for a single household operational unit. It is assumed that the rack would be used for only 50 per cent of the time during the fishing season owing to the irregularity of the fish landings. Further information on the processing stages involved and the per cent weight yields of each product is provided in Appendix I.

Table 21: Operating conditions of drying unit (single rack plus ancilliaries)

Dimensions:	25' x 7'	two-tier. (see Fig. 10)
Capacity:	100	kg of wet Anchovy (50kg/tier)
Drying time:	1-1/2	days
Weight yield:	33%	of the weight of fresh Anchovy
Prod. capacity:	22	kg of dried Anchovy/day
Oper. period:	45	days (length of season)
Total prodn.:	495	kg/season
Per cent utilization:	50%	
Life of rack:	3	years

Tables 22 provides information on the actual costs involved in construction of the rack and provision of ancilliary optional equipment, such as the plastic rain protection cover. A contingency figure has been included to account for a degree of variability in material supplies.

Table 23 shows the operating costs for the rack.

Table 22: Rack costs

		Unit cost (Rs)	Number required	Total cost
Casuarina poles	(3/4" x 13')	9.00	8.00	72.00
	(1" x 14')	11.00	9.00	99.00
	(2" x 15')	15.00	5.00	75.00
Cutting charge		1.00	1.00	1.00
Pole transport		6.00	1.00	6.00
2mm Anchovy seinenet		250.00	1.25	312.50
Coir rope		4.00	15.00	60.00
3mm pp rope		0.10	128.00	12.80
Twine		0.01	260.00	3.25
Polythene sheet cover		9.00	50.00	450.00
Stitching charge		10.00	1.00	10.00
Eyelets		0.50	16.00	8.00
Anchor ropes		0.01	12.00	0.12
Stone weights		0.00	16.00	0.00
Support ropes		0.10	80.00	8.00
Centre poles	(2" x 14")	15.00	2.00	30.00
Total				1147.67
Total with contingency 5.00%				1205.05

Table 23: Annual operating costs including product packing

Polypropylene sacks (15 kg / sack)	15.00	33.00	495.00
Ancillary replacement items:			
Palmyrah leaf mats (x10)	10.00	10.00	100.00
Rinsing baskets (large)	40.00	2.00	80.00
Rinsing baskets (small)	22.00	1.00	22.00
Twines/maintenance			76.05
Total			773.05
Total with contingency 5.00%			811.70

5.4 Comparison of traditional (sand) drying with improved (rack) method

The differences between the economics of producing dried Anchovy by traditional and rack methods are discussed under this heading.

Table 24 quantifies the advantages of the rack drying system over the traditional process by comparing the costs of the former with those of the latter. It is concluded that the margins available using the rack system can be considerably better than from the traditional system and that the cost of the rack drying system *in toto* can be paid off over a short period of time. Assumptions made here are:

- A loss in weight of 5 per cent in the traditional product due to insect infestation.
- An additional loss of 7.5 per cent in the traditional product due to spoilage and breakage. (During traditional drying, the Anchovy is effectively cooked when in direct contact with the hot sand and, hence, becomes very brittle when dry.)
- A 15 per cent actual increase in weight due to sand, from which an assumed 22 per cent is subsequently discounted (see Table 7). Sand gets added to the traditional product due to both adherence during drying and to deliberate addition to increase weight. This is generally over-accounted for by the trader, who discounts weight before bidding for the lot.
- An assumed loss of 5 per cent due to spoilage and breakage in the case of the rack-dried product.
- The price of the traditional product has been taken as Rs.7.39/kg (refer to Table 5).
- The two selling prices of the improved product have been derived from test marketing sales (see section 4.5 *et seq.* and are considered to be very conservative.

Table 24: Comparison of rack and traditional drying assuming varying product price

	<i>Sand-dried</i>	<i>Rack-dried</i> (a)	<i>Rack-dried</i> (b)
Rack cost		1205.05	1205.05
Rack operating costs		811.70	811.70
Depreciation cost over 3 years	0.00	401.68	401.68
Baskets	48.00	(inc. above)	(inc. above)
Packaging	98.94	(inc. above)	(inc. above)
Twine	0.00	(inc. above)	(inc. above)
TOTAL COST	146.94	2418.43	2418.43
Cost/kg	0.30	4.89	4.89
Total kg	495.00	495.00	495.00
Actual weight of adhering sand (say 15%)	74.25	0.00	0.00
Infestation loss	-24.75	0.00	0.00
Spoilage and breakage losses	-37.13	-24.75	-24.75
Weight discounted by trade due to sand (assumed 22% total wt)	111.62	0.00	0.00
Total kg paid for	395.75	470.25	470.25
Price	7.39	20.00	15.00
Total revenue	2,925	9,405	7,054
TOTAL COST	147	2,418	2,418
Gross margin (revenue less costs)	2,778	6,987	4,636
Revenue/day (IRs):	62	155	103
Investment (IRs):		2,418	2,418
Payback time (days):		16	23

ASSUMED CONDITIONS: see Table 21:

Total annual production for unit rack 495.00 kg (dry)
Price of traditional product (weighted avg. previous year, over two villages): 7.39 Rs/kg (see Table 5)
Price of improved product assumed to be (a) Rs.20 and (b) Rs.15 per kg.
Traditional packaging: Gunny sacks 20kg @ Rs.5 each

5.5 Proposed multi-product manufacturing operation

Building upon the above economic data based on the village level drying rack unit, a scaled-up process is proposed which centralizes management in order to optimize organization efficiency, product quality and marketing.

Production would centre on three Anchovy products : **head-on** (whole dried, primarily from the seinenet fishery), **head-off** (headless dried, from the gillnet fishery) and **flake** (dried fillets made by utilizing the head-off product from the gillnet fishery).

These would be supplied to three mutually exclusive markets :

Head-on : Bulk-packed in 15 kg polypropylene sacks and exported to Sri Lanka or West Asia.

Head-off: Bulk-packed, but would target urban Indian markets (*e.g.* Bombay, Madras, Bangalore, Thiruvananthapuram etc).

Flake : Packed in printed, retail 250 g bags with 15 kg outer polypropylene sacks for transport to export markets in Southeast Asia, principally Malaysia, Singapore and Japan, as well as to specific urban markets in India.

The total initial production proposed, by product, is as follows:

Head-on : 14,850 kg

Head-off : 22,275 kg

Flake : 11,138 kg

Waste : 5,569 kg

Table 25 proposes location, numbers and utilization of drying racks in two selected villages.

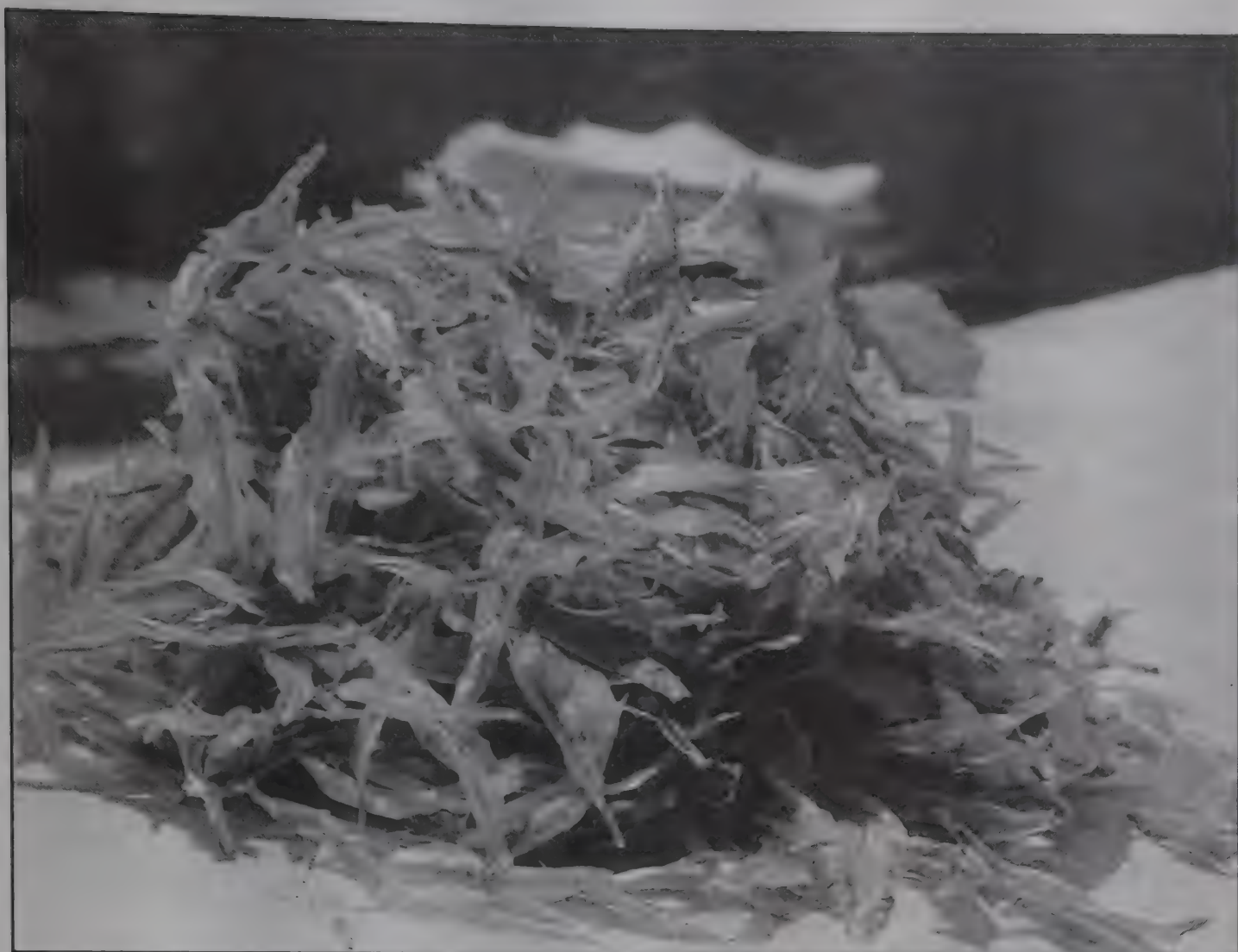
**Table 25: Proposed production quotas
by village and product type**

No. of <i>sangams</i> involved: 2						
Villages	No. racks proposed	Production /rack/season (kg)	Head-on (kg)	Head-off (kg)	% head-off for flakes	Flake ⁽¹⁾ (kg)
Pallam	60	495	14,850	14,850	50	3,713
Kovalam	60	495	0	29,700	50	7,425
Total	120		14,850	22,275 ⁽²⁾		11,138

Notes: 1. Production yields given in Appendix I

2. Assumes 50% of head-off used for flake production

The number of villages can be increased at a later stage, according to the level of success of the operation proposed. Selection criteria include land availability for drying racks, existing production of Anchovy (refer Tables 19 and 20), opinion of fishermen on ability of *sangam* to control quality, and familiarity of *sangam* members with drying rack techniques. It should again be noted that the



Anchovy flakes are made by scaling and peeling slightly rehydrated dried Poruman Anchovy followed by a short redrying period in the sun.



Anchovy flakes: the finished product has low bulk density, low moisture and high protein content of upto 90 per cent.

quantities of wet Anchovy to be used for processing represent a very small percentage of the total estimated landings. The following assumptions are made:

- Pallam, being the only village selected where seines are in regular use, will be the only centre where head-on product will be dried.
- In Kovalam, 50 per cent of the total quantity of the head-off product would be converted into flakes.

Table 26 indicates the total quantity available for sale (after discounting assumed losses of 5 per cent). This table also indicates the potential revenue from product sales.

Table 26: Actual quantities sold and revenue

<i>Product types</i>	<i>% loss</i>	<i>kg sold</i>	<i>Rate</i>	<i>Revenue (Rs. /kg)</i>
Head-on	5.00%	14,108	35.00	493,763
Head-off	5.00%	21,161	35.00	740,644
Flake	5.00%	10,581	130.00	1,375,481
Waste	0.00	5,569	4.00	22,275
Total dry product sold		51,419		2,632,163

The following assumptions are made :

- The prices of head-on and head-off Anchovy are similar and represent several quotations obtained during pilot marketing trials discussed earlier in this paper (see Section 4). The price for flakes has been determined both from trial marketing and overseas offers from prospective clients.
- A small income is also assumed from by-products (heads, broken pieces, dust etc.).

Table 27: Description of flake processing units (FPU)

Flakes to be produced (kg)	11,138
Daily FPU production (kg)	2.50
Half year production (kg)	390.00
Units needed	28.56

Table 27 describes the flake processing units (FPUs) operated with women labour.

Table 28 (facing page) provides details of the fixed capital costs with contingencies involved and working capital required. This adheres to the management structure proposed in Appendix II.

The main capital expenditure is on drying racks. These will be funded by the project and placed with fishermen families in exchange for dried Anchovy at a price agreed on. If the fishermen wish to purchase the racks outright, this can be arranged through a reduced payment in kind.

Table 28: Capital costs

Global contingency factor used: 5.00%

	<i>Unit cost (Rs)</i>	<i>Units</i>	<i>Total</i>
Central Administration			
Motorcycle	30,000	1	30,000
Office furniture	2,000	1	2,000
Typewriter	4,000	1	4,000
Total			36,000
Godown Nagercoil			
Balance beam scales	1,000	1	1,000
Package sealing machine 18"	10,000	1	10,000
Small scale	300	3	900
Baskets (plastic)	20	15	300
Extra lighting	1,000	1	1,000
Total			13,200
Sangam level			
Drying racks (avg. no. per <i>sangam</i>)	1148	60	68,860
Ancillaries (see table)	278	60	16,683
Small weighing scale (1 per <i>sangam</i>)	300	1	300
Total			85,843
Nos. of <i>sangams</i>	2		
Total for all <i>sangams</i>			171,686
Flake processing units (FPU)			
Bowls (plastic 31; 15 per FPU)	20	15	300
Mini-rack (5' x 5'; 1 per FPU)	60	1	60
Drying panel (10 per FPU)	25	10	250
Total			610
Nos of FPUs:	28.56		
Total for all FPUs			17,420
TOTAL CAPITAL COSTS			238,307
Total with contingencies			250,222
Working capital requirement (see below)			755,744
TOTAL INVESTMENT			1,005,966
Working capital: 75 per cent fish cost 75 per cent FPU cost 75 per cent administration cost 50 per cent transport and storage/ <i>sangam</i> costs			

Table 29 (facing page) provides details of the operating costs involved. These again adhere to the management structure and process flow chart proposed in Appendix II. The following assumptions are made :

- **Central Administration** : A salaried Project Manager and Accountant would be employed by the project for a full year. Although work loads are likely to slacken considerably during the lean season, stocks of products, especially of flakes, would be maintained for most of the year and administrative support would be required to manage these.
- **Godown Nagercoil** : A salaried Supervisor would be employed for 12 months and labour for 6 months. Labour wage is set at 20 Rs/day based on a six-day week.
- **Packaging** : Packaging costs include the provision of new, printed polypropylene sacks to hold 15kg of product. The cost of inner packaging for the 250g flake pack was provided by a Madras plastics converter.
- **Sangam-level supervisors** : A *sangam*-level salaried supervisor is included for each participating *sangam*. His activities would be supported by a salaried assistant.
- **Fish cost** of Rs.20 is included under operating costs. This is a direct payment to fishermen for dried Anchovy used by the project either for selling direct or for conversion into flakes. A further (bonus) payment will be made at a later stage through profit sharing : 90 per cent of net profits will revert to the fishermen producers and 10 per cent to the project (initially, to KDFS). No contingency is allowed for the fish price.
- **FPU** (see also Table 27): The highest operating cost relates to the payment of women labour for flake-making through the registered FPUs. The per kg payment has been calculated at Rs.30 (one woman can produce at least 0.5 kg per day). Clothing required comprises protective hats for women at 4 Rs/hat. The FPUs would be required to produce flakes over a six month period and would operate on a day-to-day basis, the *sangam*-level Supervisor providing 5 kg of raw material (head-off Anchovy) at the start of the day and the FPU delivering 2.5 kg of flakes at the end of the day.
- **Transport** : Rental costs are provided for a continuous 40-day period. It is assumed that utilization would be 50 per cent and the total period covered has been doubled to cover some required out-of-season use. The three-wheeler would primarily be used for transporting small quantities of raw material for flake-making as well as the finished product.

Flake-making workshop for local women from Kanniyakumari District, Tamil Nadu



Table 29: Operating costs

	<i>Unit cost</i>	<i>Units (Rs)</i>	<i>Total</i>
Central Administration			
Project Manager	2,500	12	30,000
Accountant	1,500	12	18,000
Petrol	1,200	1	1,200
Telephone charges	4,000	1	4,000
Telex charges	2,500	1	2,500
Office materials	2,000	1	2,000
Total			57,700
Godown Nagercoil			
Godown Supervisor (x 1)	1,500	12	18,000
Labourers (sorting) (x 3)	1,440	6	8,640
Labourers (lifting) (x 2)	960	6	5,760
Packaging (includes <i>sangam</i> packing):			
Packaging head-on	1.00	14,108	14,108
Packaging head-off	1.00	21,161	21,161
Packaging flake	4.36	10,581	46,132
Mats	10	10	100
Warehouse/godown rental	2,500	12	30,000
Record-keeping materials	250	1	250
Electricity	600	6	3,600
Total			147,750
Fish Cost			
Cost of advance paid to fishermen	20	59,400	1,188,000
Sangam Level			
Rack drying costs (ancillary & operating costs less packaging)	278	60	16,683
Sangam level Supervisor	1,000	12	12,000
Assistant	500	6	3,000
Record-keeping materials	100	1	100
Total			31,783
Nos of <i>sangams</i>	2.00		
Total for all <i>sangams</i>			63,566
Flake Processing Units (FPU)			
	<i>Rs/kg paid</i>	<i>kg/year</i>	
Labour	30	390	11,700
Clothing (Rs/person)	4	10	40
Total			11,740
Nos of FPUs:	28.56		
Total for all FPUs			335,267
Transport Costs			
	<i>Rs/km</i>	<i>No. km</i>	
Truck hire	2.6	11,250	29,250
Retaining charge (Rs.25/day)	25	45	1,125
3-wheeler (45dys*250km/dy)	1	11,250	11,250
Total			41,625
TOTAL OPERATING COSTS			1,833,909
Total with contingencies (on all items except fish)			1,866,204

Tables 30 summarizes the capital and operating costs mentioned above and calculates the overall project cost.

Table 30: Total project costs

	Rs
Summary of total capital costs	
1. Central administration	36,000
2. Transport	0
3. Storage/packing	13,200
4. Sangam-level investment	171,686
5. Flake-making	17,420
Total fixed cost	238,306
Total with contingency of 5%	250,222
Working capital	755,744
TOTAL INVESTMENT	1,005,966
Summary of total annual operating costs	
1. Central administration	57,700
2. Storage/packing	147,750
3. Fish cost (advance to fisherman)	1,188,000
4. Sangam level & rack maintenance	63,566
5. Flake-making	335,267
6. Transport	41,625
TOTAL OPERATING COSTS	1,833,908
Total with contingency of 5% excluding fish cost	1,866,204

Table 31 describes the *likely* financial conditions required for the project. Interest rates are calculated at 16.5 per cent/year plus 1.5 per cent guarantee (total 18 per cent), repayable quarterly over a three-year period. The KDFSf would be expected to contribute a 30 per cent equity share.

Table 31: Financing

Amount to be financed: 1,005,966 (see text)		
Equity share:	15%	150,895
Bank share:	85%	855,071
Interest rate:	18%	
Payments per year:	4.00	
Term (years):	3.00	
Repayment amount:	93,772	per quarter year

Table 32 provides an overall summary of the financial analysis for the conditions and assumptions described above. A discounted cash flow (DCF) is presented for a three-year period and the IRR is calculated for the project prior to financing. This assumes that only 50 per cent production would be achieved during the first year. An indication is also provided of the likely level of bonus payable on a per kilogram basis to each fisherman involved, if the assumed conditions of the project are met. This payment, representing upto 90 per cent of the profits, could be made only after all the season's revenue has been received. The remaining 10 per cent of profits would be invested by the KDFSf project.

A noteworthy point is the quantity of cash paid to the community through fish purchase and labour. In the model, as presented, this amounts to over Rs. 1.5 millions before the bonus is paid. The bonus would then add approximately a further Rs. 700,000 to this amount.

Table 32: Overall project summary

Discounted cash flow analysis over 3-year period before financing assuming 50% production and sales in first year				
	Year 0	Year 1	Year 2	Year 3
Fixed capital	250,222			
Working capital		755,744		(755,744)
Operating cost		996,767	1,866,204	1,866,204
		0	0	0
Total cost	250,222	1,752,511	1,866,204	1,110,460
Total revenue		1,316,081	2,632,163	2,632,163
Net cash flow	(250,222)	(436,430)	765,958	1,521,703
IRR = 80.8				
Assumptions:		Payments to fisherfolk (IRs):		
Nos. sangams	2	Total paid to women FPU's	335,267	
No. FPU's	29	Total paid to fishermen	1,188,000	
Total FPU women employed	143	Price paid/kg	20	
Nos. racks	120	Likely bonus payable/kg produce	11.61	
Rack usage-level assumed	50 %			
Rack production	495 kg/season			
Length season	45 days			

Table 33 summarizes the results of several sensitivities tested in the model.

The IRRs for all the variables tested are acceptable. However, the means of financing is clearly an area which must be carefully assessed. Although the fixed capital outlay is small, working capital requirements are high due to the labour intensive nature of the project and likely delays in payment for finished product.

Apart from finance, the project appears to be very sensitive to produce price.

Flake production is the most preferable option, as this yields a higher return at the product price assumed. An increase in flake production would also have great social benefit in terms of increased employment. A problem, however, would be the increasing difficulty in controlling product quality. Doubling the production level of the head-on or head-off products yields the same return as the standard model.

Table 33: Sensitivity analysis

	IRR
Standard model without finance	80.83%
Standard model with finance	20.5% (see Table 31)

The following are carried out on the standard model before financing:

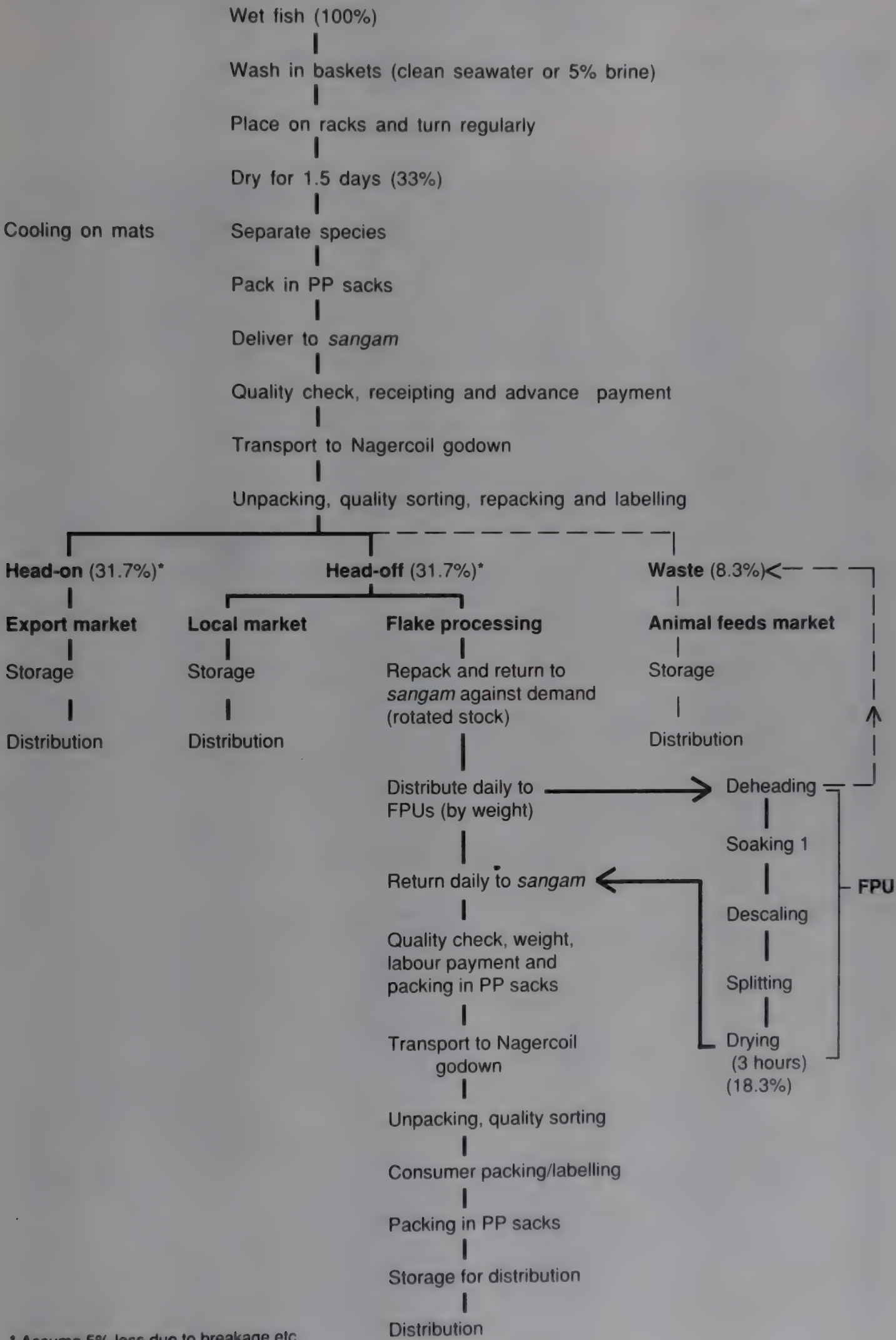
Double production (240 racks)	109.3%	
Price increase (10%)	117.6%	
Price decrease (10%)	46.1%	
Reduce rack cost (25%)	88.0%	
Increase FPU labour to 50 Rs/kg	46.2%	
		(10% less price)
Flake production only	115.5%	73.5%
Flake production only, double production	143.5%	95.5%
No flake production	53.1%	24.2%
No flake production, double production	81.5%	47.5%

Calculated minimum prices to give IRR = 10% on standard model at 100% production of each type:

Flakes	Rs. 95.05
Head-on	Rs. 29.75
Head-off	Rs. 29.75

APPENDIX I

Process flow chart for dried Anchovy and Anchovy products
(percentages in parentheses represent weight yields CFX wet fish)

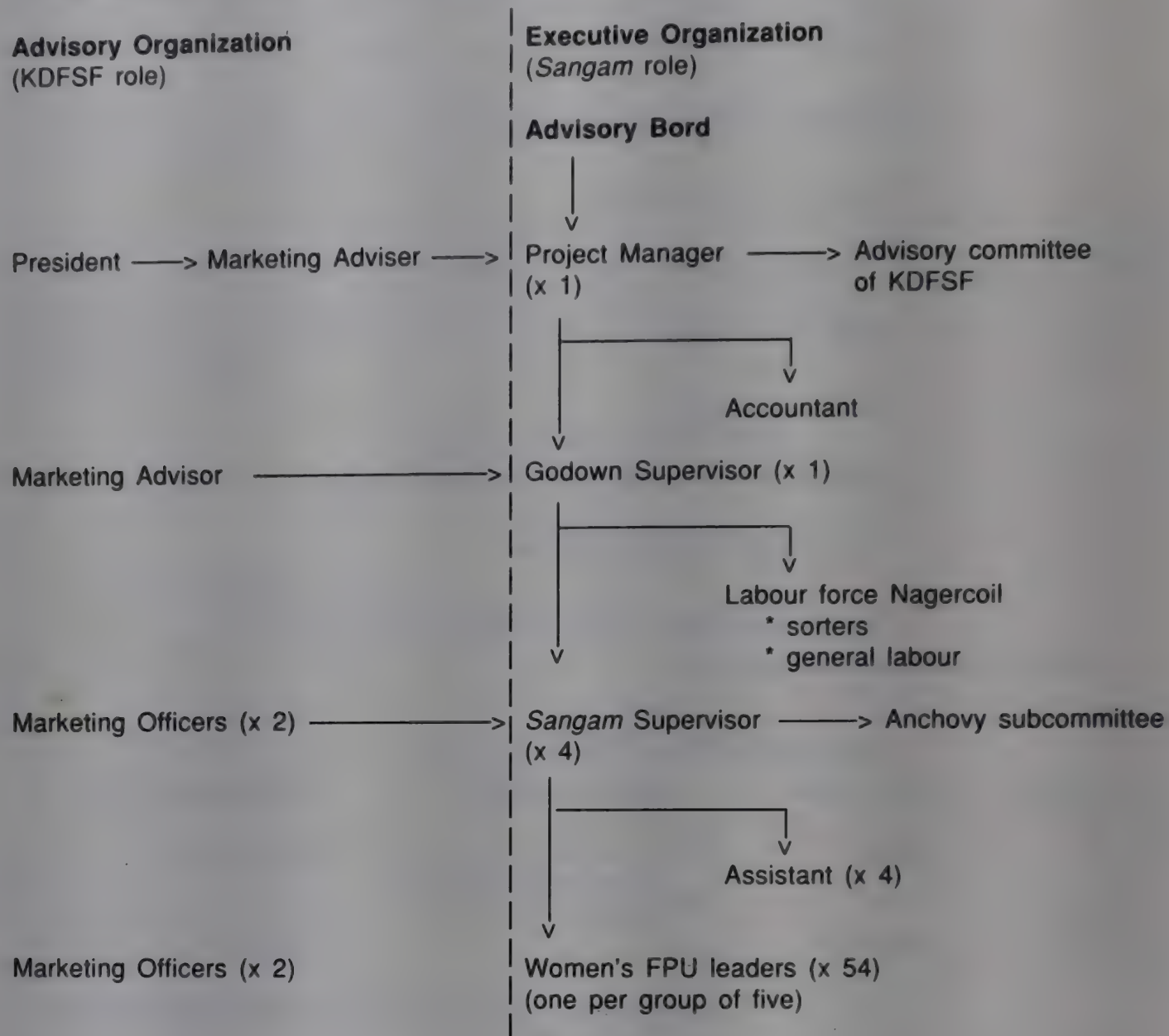


* Assume 5% loss due to breakage etc.

APPENDIX II

Proposed organization structure for Anchovy production unit

Additional advisory role of BOBP (and collaborating agencies such as CIFT) will be through the KDFSf President and Marketing Adviser.



Description and roles

Overall Supervisor (x 1)

- Selected from one of the target communities.
- Overall coordination of product and marketing.
- Coordination of product marketing and distribution.

Godown Supervisor

- Supervise unpacking/packing and labelling.
- Responsible for quality sorting.
- Coordination with *sangam* supervisors.
- Receipt and despatch of product/raw material

Sangam Supervisors

- Administration of credit for racks.
- AC checking of local production.
- Payment and receipting (whole and flakes).
- Despatch of packed Anchovy.
- Requisition of flake raw material.
- Supervision of whole and flake making.
- Coordination/registration FPU.

Women's FPU leaders

- Collection of raw material.
- Delivery of flakes.
- Control of FPU processing.

BIBLIOGRAPHY

SIFFS (1992): KDFS/SIFFS survey (August 1988 - July 1989) fish handling and marketing in Kanniyakumari District SIFFS, Thiruvananthapuram.

ODI (1991): Kanyakumari District Fishermen's Sangams Federation: Case Study Evaluation No.3

SANDERS, A. (1988): Fisheries NGOs in Bay of Bengal (internal report, BOBP), Madras.

CIFT (1990): Handling and processing of Anchoviella in Kanniyakumari District, Tamil Nadu (report of BOBP), Madras.

BOSTOCK, T.W. (1990): Report on visit to Sri Lanka to determine the feasibility of developing import market for Indian dried Anchovy (internal report of BOBP), Madras.



PUBLICATIONS OF THE BAY OF BENGAL PROGRAMME (BOBP)

The BOBP brings out the following types of publications:

Reports (BOBP/REP/...) which describe and analyze completed activities such as seminars, annual meetings of BOBP's Advisory Committee, and subprojects in member-countries for which BOBP inputs have ended.

Working Papers (BOBP/WP/...) which are progress reports that discuss the findings of ongoing BOBP work.

Manuals and Guides (BOBP/MAG/...) which are instructional documents for specific audiences.

Information Documents (BOBP/INF/...) which are bibliographies and descriptive documents on the fisheries of member-countries in the region.

Newsletters (*Bay of Bengal News*) which are issued quarterly and which contain illustrated articles and features in non-technical style on BOBP work and related subjects.

Other publications which include books and other miscellaneous reports.

A list of publications in print follows. A complete list of publications is available on request.

Reports (BOBP/REP/...)

23. *Summary Report of BOBP Fishing Trials and Demersal Resources Studies in Sri Lanka*. (Madras, March 1986.)
24. *Fisherwomen's Activities in Bangladesh : A Participatory Approach to Development*. P Natpracha, (Madras, May 1986.)
25. *Attempts to Stimulate Development Activities in Fishing Communities in Adirampattinam, India*. P Natpracha, V L C Pietersz. (Madras, May 1986.)
26. *Report of the Tenth Meeting of the Advisory Committee*. Malé, Maldives. 17-18 February 1986. (Madras, April 1986.)
28. *Small-scale Aquaculture Development Project in South Thailand: Results and Impact*. E Drewes. (Madras, May 1986.)
29. *Towards Shared Learning: An Approach to Non-formal Adult Education for Marine Fisherfolk of Tamil Nadu, India*. L S Saraswathi and P Natpracha. (Madras, July 1986.)
30. *Summary Report of Fishing Trials with Large-mesh Driftnets in Bangladesh*. (Madras, May 1986.)
31. *In-service Training Programme for Marine Fisheries Extension Officers in Orissa, India*. U Tietze. (Madras, August 1986.)
32. *Bank Credit for Artisanal Marine Fisherfolk of Orissa, India*. U Tietze. (Madras, May 1987.)
33. *Non-formal Primary Education for Children of Marine Fisherfolk in Orissa, India*. U Tietze and Namita Ray. (Madras, December 1987.)
34. *The Coastal Set Bagnet Fishery of Bangladesh — Fishing Trials and Investigations*. S E Akerman. (Madras, November 1986.)
35. *Brackishwater Shrimp Culture Demonstration in Bangladesh*. M Karim. (Madras, December 1986.)
36. *Hilsa Investigations in Bangladesh*. (Colombo, June 1987.)
37. *High-Opening Bottom Trawling in Tamil Nadu, Gujarat and Orissa, India : A Summary of Effort and Impact* (Madras, February 1987).
38. *Report of the Eleventh Meeting of the Advisory Committee*, Bangkok, Thailand, March 26-28, 1987. (Madras, June 1987.)
39. *Investigations on the Mackerel and Scad Resources of the Malacca Straits*. (Colombo, December 1987).
40. *Tuna in the Andaman Sea*. (Colombo, December 1987)
41. *Studies of the Tuna Resource in the EEZs of Sri Lanka and Maldives*. (Colombo, May 1988)
42. *Report of the Twelfth Meeting of the Advisory Committee*. Bhubaneswar, India, 12-15 January, 1988. (Madras, April 1988).
43. *Report of the Thirteenth Meeting of the Advisory Committee*. Penang, Malaysia, 26-28 January, 1989. (Madras, March 1989).
44. *Report of the Fourteenth Meeting of the Advisory Committee*. Medan, Indonesia, 22-25 January, 1990. (Madras, April 1990).
45. *Report of the Seminar on Gracilaria Production and Utilization in the Bay of Bengal Region*. (Madras, November 1990).
46. *Exploratory Fishing for Large Pelagic Species in the Maldives* R C Anderson and A Waheed, (Madras, December 1990.)
47. *Exploratory Fishing for Large Pelagic Species in Sri Lanka*. R Maldeniya and S L Suraweera. (Madras, April 1991.)
48. *Report of the Fifteenth Meeting of the Advisory Committee*3. Colombo, Sri Lanka, 28-30 January, 1991. (Madras, April 1991).
49. *Introduction of New Small Fishing Craft in Kerala*. O Gulbrandsen and M R Anderson. (Madras, January 1992.)
50. *Report of the Sixteenth Meeting of the Advisory Committee*. Phuket, Thailand, 20-23 January, 1992. (Madras, April 1992.)
51. *Report of the Seminar on Mud Crab Culture and Trade in the Bay of Bengal Region*, November 5-8, Surat Thani, Thailand. (Madras, September 1992.)
52. *Feeds for Artisanal Shrimp Culture in India — Their Development and Evaluation*. (Madras, September 1992.)

Working Papers (BOBP/WP/...)

27. *Reducing the Fuel Costs of Small Fishing Boats*. O Gulbrandsen. (Madras, July 1986.)

38. *Credit for Fisherfolk : The Experience in Adicampattinam, Tamil Nadu, India.* R S Anbarasan and O Fernandez. (Madras, March 1986.)
42. *Fish Trap Trials in Sri Lanka.* (Based on a report by T Hammerman). (Madras, January 1986.)
43. *Demonstration of Simple Hatchery Technology for Prawns in Sri Lanka.* (Madras, June 1986.)
44. *Pivoting Engine Installation for Beachlanding Boats.* A Overa, R Ravikumar. (Madras, June 1986.)
45. *Further Development of Beachlanding Craft in India and Sri Lanka.* A Overa, R Ravikumar, O Gulbrandsen, G Gowing. (Madras, July 1986.)
46. *Experimental Shrimp Farming in Ponds in Polekurru, Andhra Pradesh, India.* J A J Janssen, T Radhakrishna Murthy, B V Raghavulu and V Sreekrishna. (Madras, July 1986.)
47. *Growth and Mortality of the Malaysian Cockle. (Anadara granosa) under Commercial Culture : Analysis through Length-frequency Data.* NG Fong Oon. (Madras, July 1986.)
48. *Fishing Trials with High-Opening Bottom Trawls from Chandipur, Orissa, India.* G Pajot and B B Mohapatra. (Madras, October 1986.)
49. *Pen Culture of Shrimp by Fisherfolk : The BOBP Experience in Killai, Tamil Nadu, India.* E Drewes, G Rajappan. (Madras, April 1987.)
50. *Experiences with a Manually Operated Net-Braiding Machine in Bangladesh.* B C Gillgren, A Kashem. (Madras, November 1986.)
51. *Hauling Devices for Beachlanding Craft.* A Overa, P A Hemminghyth. (Madras, August 1986.)
52. *Experimental Culture of Seaweeds (Gracilaria Sp.) in Penang, Malaysia.* (Based on a report by M Doty and J Fisher). (Madras, August 1987.)
53. *Atlas of Deep Water Demersal Fishery Resources in the Bay of Bengal.* T Nishida and K Sivasubramaniam. (Colombo, September 1986.)
54. *Experiences with Fish Aggregating Devices in Sri Lanka.* K T Weerasooriya. (Madras, January 1987.)
55. *Study of Income, Indebtedness and Savings among Fisherfolk of Orissa, India.* T Mammo. (Madras, December 1987.)
56. *Fishing Trials with Beachlanding Craft at Uppada, Andhra Pradesh, India.* L Nyberg. (Madras, June 1987.)
57. *Identifying Extension Activities for Fisherwomen in Visakhapatnam District, Andhra Pradesh, India.* D Tempelman. (Madras, August 1987.)
58. *Shrimp Fisheries in the Bay of Bengal.* M Van der Knaap. (Madras, August 1989.)
59. *Fishery Statistics in the Bay of Bengal.* T Nishida. (Colombo, August 1988.)
60. *Pen Culture of Shrimp in Chilaw, Sri Lanka.* D Reyntjens. (Madras, April 1989.)
61. *Development of Outrigger Canoes in Sri Lanka.* O. Gulbrandsen. (Madras, November 1990.)
62. *Silvi-Pisciculture Project in Sunderbans, West Bengal : A Summary Report of BOBP's assistance.* C L Angell, J Muir. (Madras, September 1990.)
63. *Shrimp Seed Collectors of Bangladesh.* (Based on a study by UBINIG.) (Madras, October 1990.)
64. *Reef Fish Resources Survey in the Maldives.* M Van der Knaap, Z Waheed, H Shareef and M Rasheed (Madras, April 1991.)
65. *Seaweed (Gracilaria Edulis) Farming in Vedalai and Chinnapalam, India.* Ineke Kalkman, Isaac Rajendran and Charles L Angell. (Madras, June 1991.)
66. *Improving Marketing Conditions for Women Fish Vendors in Besant Nagar, Madras.* K Menezes. (Madras, April 1991.)
67. *Design and Trial of Ice Boxes for Use on Fishing Boats in Kakinada, India.* I J Clucas. (Madras, April 1991.)
68. *The By-catch from Indian Shrimp Trawlers in the Bay of Bengal: The potential for its improved utilization.* Ann Gordon. (Madras, August 1991.)
69. *Agar and Alginate Production from Seaweed in India.* J J W Coopen, P Nambiar. (Madras, June 1991.)
70. *The Kattumaram of Kothapatnam-Pallipalem, Andhra Pradesh, India — A survey of the fisheries and fisherfolk.* Dr K Sivasubramaniam. (Madras, December 1991.)
71. *Manual Boat Hauling Devices in the Maldives.* (Madras, November 1992.)
72. *Giant Clams in the Maldives — A stock assessment and study of their potential for culture.* Dr J R Barker. (Madras, December 1991.)
73. *Small-scale Culture of the Flat Oyster (Oyster folium) in Pulau Langkawi, Kedah, Malaysia.* Devakie Nair and Bjorn Lindeblad. (Madras, November 1991.)
74. *A Study of the Performance of Selected Small Fishing Craft on the East Coast of India.* Gardien El Gendy. (Madras, August 1992.)
75. *Fishing Trials with Beachlanding Craft at Thirumullaivasal, Tamil Nadu, India 1989-1992.* G Pajot. (Madras, November 1992.)
76. *A View from the Beach — Understanding the status and needs of fisherfolk in the Meemu, Vaavu and Faafu Atolls of the Republic of Maldives.* The Extension and Projects Section of the Ministry of Fisheries and Agriculture, The Republic of Maldives. (Madras, June 1991.)
77. *Development of Canoe Fisheries in Sumatera, Indonesia.* O Gulbrandsen and G Pajot. (Madras, April 1992.)
78. *The Fisheries and Fisherfolk of Nias Island, Indonesia. A description of the fisheries and a socio-economic appraisal of the fisherfolk.* Based on reports by G Pajot and P Townsley. (Madras, December 1991.)

79. *Review of the Beche De Mer (Sea Cucumber) Fishery in the Maldives*. Leslie Joseph. (Madras, April 1992.)
80. *Reef Fish Resources Survey in the Maldives — Phase Two*. R. C Anderson, Z Waheed and A. Arif. (Madras, April 1992.)
81. *Exploratory Fishing for Large Pelagic Species in South Indian Water*. Jean Gallene and Robert Hall. (Madras, November 1992.)
82. *Cleaner Fishery Harbours in the Bay of Bengal*. R Ravikumar (Madras, April 1992.)
83. *Survey of Fish Consumption in Madras*. Marketing and Research Group, Madras, India. (Madras, October 1992.)
85. *The Processing and Marketing of Anchovy in the Kanniyakumari District of South India: Scope for Development*. T W Bostock, M H Kalavathy and R Vijaynidhi. (Madras, December 1992.)

Manuals and Guides (BOBP/MAG/...)

1. *Towards Shared Learning : Non-formal Adult Education for Marine Fisherfolk. Trainers' Manual*. (Madras, June 1985.)
2. *Towards Shared Learning : Non-formal Adult Education for Marine Fisherfolk. Animators' Guide*. (Madras, June 1985.)
3. *Fishery Statistics on the Microcomputer : A BASIC Version of Hasselblad's NORMSEP Program*. D Pauly, N David, J Hertel-Wulff. (Colombo, June 1986.)
4. *Separating Mixtures of Normal Distributions : Basic programs for Bhattacharya's Method and Their Application for Fish Population Analysis*. H Goonetilleke and K Sivasubramaniam. (Madras, November 1987.)
5. *Bay of Bengal Fisheries Information System (BOBFINS): User's Manual*. (Colombo, September 1987.)
8. *Extension Approaches to Coastal Fisherfolk Development in Bangladesh: Guidelines for Trainers and Field Level Fishery Extension Workers*. Department of Fisheries, Ministry of Fisheries and Livestock, Government of Bangladesh and Bay of Bengal Programme. (In Bangla) (Bangladesh, July 1992.)
10. *Our Fish, Our Wealth*. A guide to fisherfolk on resources management. — In 'comic book' style (English/Tamil/Telugu). Kamala Chandrakant with K Sivasubramaniam and Rathin Roy. (Madras, December 1991.)

Information Documents (BOBP/INF/...)

9. *Food and Nutrition Status of Small-Scale Fisherfolk in India's East Coast States : A Desk Review and Resource Investigation*. V Bhavani. (Madras, April 1986.)
10. *Bibliography on Gracilaria — Production and Utilization in the Bay of Bengal*. (Madras, August 1990.)
11. *Marine Small-Scale Fisheries of West Bengal : An Introduction*. (Madras, November 1990.)
12. *The Fisherfolk of Puttalam, Chilaw, Galle and Matara — A study of the economic status of the fisherfolk of four fisheries districts in Sri Lanka*. (Madras, December 1991.)
13. *Bibliography on the Mud Crab Culture and Trade in the Bay of Bengal Region*. (Madras, October 1992.)

Newsletters (Bay of Bengal News)

Quarterly

Other Publications

- Artisanal Marine Fisherfolk of Orissa : Study of their Technology, Economic Status, Social Organization and Cognitive Patterns*. U Tietze. (Madras, December 1985.)
- Studies on Mesh Selectivity and Performance : The New Fish-cum-Prawn Trawl at Pesalai, Sri Lanka*. BOBP/MIS/3. M S M Siddeek. (Madras, September 1986.)
- Motorization of Dinghy Boats in Kasafal, Orissa*. BOBP/MIS/4. S Johansen and O Gulbrandsen. (Madras, November 1986.)
- Helping Fisherfolk to Help Themselves : A Study in People's Participation*. (Madras, 1990.)

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